REPORT

OF THE

INTERMEDIATE PORTS DEVELOPMENT COMMITTEE

April, 1960

GOVERNMENT OF INDIA
MINISTRY OF TRANSPORT AND COMMUNICATIONS
NEW DELHI

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REPORT

OF THE

INTERMEDIATE PORTS DEVELOPMENT COMMITTEE

CHAPTER I

INTRODUCTORY

Appointment and Composition of the Committee

1.1. The Government of India vide their Resolution No. 1-PDII (24)/57, dated the 27th October, 1958 appointed a Committee known as the Intermediate Ports Development Committee to select suitable intermediate ports in India for intensive development in order of priority and to determine the extent of development required at these ports. Originally the Committee consisted of:

1. Shri H. P. Matharani, Development Adviser and *Ex-Officio* Joint Secretary in the Department of Transport, Ministry of Transport and Communications—*Chairman.*
2. Shri K. Ranganathan, Deputy Secretary in the Department of Transport, Ministry of Transport and Communications.
3. Shri D. Sandilya, Joint Secretary in the Ministry of Commerce and Industry.
4. A representative of the Ministry of Railways.
5. Shri K. N. Srinivasan, Chief Engineer, Madras Port Trust.
6. Shri M. S. Venkataraman, Administrative Officer, Cochin Harbour.
7. Shri H. P. Oza, Principal Port Officer and Engineer, Bombay State.
8. Captain M. L. Advani, State Port Officer, Mysore State.
9. Captain C. Sankunni, State Port Officer, Madras State.
10. Capt. L. T. Yettie, State Port Officer, Andhra Pradesh.
11. Shri G. Madhavan, I.A.S., Secretary to the Government of Kerala.
12. Dr. H. B. Mohanty, M.Sc., Ph.D. (Cantab), *Ex-Officio* Additional Secretary to the Government of Orissa, and Commissioner to the Port of Paradip.
13. Shri S. N. Haji, Representative of the Shipping Interests, Bombay.
14. Shri I. G. Chacko, Officer on Special Duty (Minor Ports), Department of Transport, Ministry of Transport & Communications—*Member Secretary.*

1.2. Subsequently the Government of India appointed the following additional members to serve on the Committee *vide* Resolution Nos. 1-PDII (24)/57, dated the 27th December, 1958 and the 4th May, 1959;

1. The Nautical Adviser to the Government of India.

2. Shri T. M. Goculdas, Bombay, Representative of the Shipping interests.

3. Shri N. L. Kanoria, Calcutta, Representative of the Federation of Indian Chambers of Commerce and Industry.

4. Shri K. L. Luthra, Assistant Chief (now Director), Transport Division, Planning Commission.

5. Shri Ghanshyamlal Gopalji Thakkar, Bhavnagar.

1.3. When Shri G. Madhavan, one of the Members of the Committee, retired from service, the Government of India *vide* Resolution No. 1-PDII (24)/57-IWT, dated the 6th October, 1959 appointed Dr. C. R. Krishnamoorthy as Member in his place. Again on the transfer of Shri K. G. S. Iyer, the Government of India *vide* Resolution No. 1-PDII (24)/57-IWT, dated the 21st March 1960 appointed Shri V. P. Sawhney, Joint Director, Traffic Transportation, Railway Board, in his place. Captain W. B. Piggot served on the Committee right throughout in his capacity as the Nautical Adviser to the Government of India.

1.4. The final composition of the Committee is as follows:—

1. Shri H. P. Matharani, Development Adviser & *Ex-Officio* Joint Secretary, in the Department of Transport, Ministry of Transport and Communications—*Chairman*.

2. Shri D. Sandilya, Joint Secretary in the Ministry of Commerce and Industry.

3. Capt. W. B. Piggot, Nautical Adviser to the Government of India, Bombay.

4. Shri M. S. Venkataraman, Administrative Officer, Cochin Harbour.

5. Shri K. Ranganathan, Deputy Secretary in the Department of Transport, Ministry of Transport and Communications.

6. Shri K. L. Luthra, Director (Transport), Planning Commission.

7. Shri V. P. Sawhney, Joint Director, Traffic Transportation, Railway Board.

8. Dr. C. R. Krishnamoorthy, I.A.S., Secretary to the Government of Kerala, P.W. Deptt.

9. Dr. H. B. Mohanty, Commissioner Paradip Port and *Ex-Officio* Additional Secretary to Government of Orissa, Political and Services Department.

10. Shri K. N. Srinivasan, Chief Engineer, Madras Port Trust.

11. Capt. C. Sankunni, State Port Officer, Madras.

12. Capt. L. T. Yettie, State Port Officer, Andhra Pradesh.

13. Shri H. P. Oza, Principal Port Officer & Engineer, Bombay State.

14. Capt. M. L. Advani, State Port Officer, Mysore State.

15. Shri T. M. Goculdas, Bombay, Representative of the Shipping interests.

16. Shri S. N. Haji, Representative of the Shipping interests, Bombay.

17. Shri N. L. Kanoria, Calcutta, Representative of the Federation of Indian Chambers of Commerce and Industry.

18. Shri Ghanshyamlal Gopalji Thakkar, Bhavanagar.

19. Shri I. G. Chacko, Officer on Special Duty (Minor Ports), Department of Transport, Ministry of Transport & Communications—*Member Secretary.*

1.5. The services of Shri D. P. Ohri, Section Officer, Ministry of Transport and Communications, Department of Transport, were placed by the Government of India at the disposal of the Committee on 1st April, 1959 to act as Assistant Secretary of the Committee.

The Terms of Reference

1.6. The following terms of reference were given to the Committee.

(i) Selection of suitable intermediate ports in India for intensive development in order of priority, taking into account

(a) broad national considerations as well as regional requirements;

(b) engineering aspects with emphasis on economy of construction and maintenance; and

(c) traffic potential of the hinterland and transport costs.

(ii) Determination of the extent of development required at these ports as well as allied transport developments, having regard to the needs of the entire area to be served, and the financial implications thereof.

Method of Approach

1.7. Before the first meeting of the Committee, a draft questionnaire was prepared by the Secretariat of the Committee and circulated to all the Members of the Committee on 18th November, 1958. After comments of various members were received the questionnaire was finalised, and circulated to all the State Governments, recognised Chambers of Commerce, Shipping Companies and other trade interests on 11th December 1959 with a request that answers may be made available to the Committee by 12th January, 1959. A copy of this questionnaire is given in Appendix I of this report. A list of the addresses is given in Appendix II. The Committee received answers to the questionnaire from all the maritime State Governments and several other organisations. A list of these together with the list of the parties which forwarded representations and Memoranda to the Committee is given in Appendix III-A, III-B and III-C.

1.8. As soon as the answers to the questionnaire were received, the Committee first met at Madras on 4th March, 1959. At this meeting the Committee chalked out its future course of action. Broadly the Committee decided to visit and study at site all the intermediate ports of India as classified by the Government of India with the exception of Mandvi in Kutch and Navalakhi in Saurashtra for further development of which no suggestions were received from the State Government concerned and where the facilities already existing were reported to be adequate for the needs of traffic anticipated in the near future. In addition, it was decided to visit and study those minor ports which had a case for further development as intermediate ports. The Committee considered the minor ports of Paradip, Quilon, Redi, Surat and Sika to fall in this

category. The Committee also decided that after their visits to the ports detailed discussions should be held with the officials and commercial and industrial interests connected with these ports, both locally and at the head quarters of the varions maritime States. A map of India showing the routes studied by the Committee is given as Drawing No. IPDC.—1.

1.9. In view of the fact that the Chairman, the Members and the Member Secretary of the Committee had to carry out the work of the Committee in addition to their normal duties, the Committee felt that the tours to the ports which would necessarily have to be lengthy, should be restricted to one in a month. It was also decided that no useful purpose would be served in visiting these ports during the south-west monsoon when the ports would be closed.

1.10. The Committee commenced their visits to the ports in March 1959 and completed all the inspection tours by December, 1959 as per itinerary given in Appendix IV. A list of the gentlemen, officials and organisations with whom the Committee held discussions and obtained their views is recorded in Appendix V. While at the capital cities of the various maritime States, the Committee also met and sought the views of the Chief Ministers and the Hon'ble Ministers, in charge of ports. The names of the Chief Ministers and the Hon'ble Ministers whom the Committee had the honour to meet, are included in Appendix VI. During the tours of the Committee, the Committee also held meetings amongst themselves to review the work done and to chalk out further course of action. Such meetings were held at Karwar on 30th April, 1959, Bangalore on 6th May, 1959, Bhubaneswar on 16th September, 1959, Poona on 26th October, 1959, Trivendrum on 18th November, 1959, Veraval on 18th December, 1959, Ahmedabad on 20th December, 1959 and Bombay on 21st December, 1959.

1.11. After the completion of the inspection tours of the Committee in December 1959, the Committee decided to appoint a Technical Sub-committee to go into the engineering and navigational aspects of the various proposals put forward in respect of development of the ports. This sub-committee consisted of Shri H. P. Mathurani, Chairman, Shri K. N. Srinivasan, Capt. W. B. Piggot, and Shri I. G. Chacko. The Sub-committee met in New Delhi from the 9th to the 13th of January 1960 and went into the technical aspects of all the proposals including their estimated costs. The findings of the Sub-committee were made available to the Committee on the 27th January, 1960.

1.12. The Committee met at New Delhi from 27th to 29th January, 1960 and at Hyderabad from 14th March to 17th March, 1960, to discuss the findings of the Sub-Committee and to decide the extent of development which should be carried out at the various ports and the priorities to be accorded therefor. On a directive received from the Government of India on 23rd March, 1960 to submit its interim report by 31st March, 1960 and the final report by 15th April, 1960 the Committee met at New Delhi on 30th March 1960. At this meeting some of the members present stated that they were not in favour of submitting recommendations of the Committee without explaining reasons. The Committee requested the Chairman to express their regrets to the Government for their inability to submit the interim report by 31st March, 1960 and to explain reasons therefor. The Committee also appointed an Iron Ore

Sub-Committee to go into the question of export of iron ore on an all-India basis so far as the intermediate ports were concerned. The Iron Ore Sub-committee was to consist of Sarvashri H. P. Matharani, D. Sandilya, V. P. Sawhney, K. L. Luthra and I. G. Chacko. This Sub-committee was directed to submit its report at a very early date. It was also decided that the main Committee should meet at New Delhi from the 21st to 23rd April, 1960 to finalise the report and submit the same to the Government. In view of the above, the Committee requested the Chairman to inform the Government of its inability to submit the final report by 15th April, 1960 and to promise to submit the same by end of April, 1960.

1.13. The Iron Ore Sub-committee met in New Delhi on the 13th April, 1960 and its findings were made available to the Committee on 18th April, 1960. Thereafter the draft of the report was completed and the Committee met at New Delhi from 21st to 24th April 1960 to consider the report.

1.14. The order of presentation of the ports in the subsequent chapters of this report is based on a geographical order, commencing from Paradip, the northern-most port visited by the Committee on the east coast and ending with Bedi in the Gulf of Kutch on the west coast. The order of presentation is, therefore, not meant either to indicate priorities or the comparative importance of these ports.

1.15. In presenting the various engineering, navigational and traffic data pertaining to the ports in subsequent chapters of this report, the Committee had necessarily to rely on information and data made available to the Committee by the State Governments. In respect of certain ports, additional field data were collected by the State Governments at the instance of the Committee. The different proposals for port development are based on such data.

1.16. The proposals recommended by the Committee may be considered as rough projects for the purpose of giving administrative approval only. Before commencing the execution of the projects detailed plans and estimates will have to be prepared on the basis of further data to be collected in respect of soil conditions, tides, winds, waves and currents etc. These data should be collected by qualified persons and the Committee's proposals may be modified, if necessary, in the light of fresh data that may become available.

Chapter II

IRON ORE EXPORTS

General

2.1. In view of the important role iron ore traffic will play in the future in deciding the ports to be developed, the Committee went into the question of the future possibility of iron ore exports from India and the ports through which these exports should be economically routed.

2.2. Indian iron ore has increasingly become one of the major items of export trade. The geographical position of India enables her to become a base source of supply to the Japanese Steel Industry as well as to the developing steel expansion programmes of the East European Countries, and Western Europe. The qualities of iron ore available for export are suitable for use in the open hearth as well as blast furnace. They compare favourably with the qualities available in other major sources like Brazil, Canada, Sweden, Chile and North and South Africa. India has considerable deposits, especially in areas where the prospect of setting up large steel plants are not immediate. For a period of ten to fifteen years atleast, beginning from 1960-61, it should be possible to export very substantial quantities of iron ore in order to earn foreign exchange as well as to develop, in the process, the transport and other facilities in the areas concerned.

Export Prospects

2.3. According to the note and estimates presented by Shri D. Sandilya, Managing Director, State Trading Corporation which is given as Appendix XVIII in this Report, in addition to 6 million tons of iron ore to be exported under specific Agreements with the Japanese Steel Industry, namely, from Bailadilla and Kiriburu deposits through Vizagapatam Port, exports of 9 million tons in 1965-66 are assumed for planning purposes. Thus, the total exports envisaged immediately after the commencement of exports under the Bailadilla project *i.e.*, in 1966-67, are expected by the State Trading Corporation to be of the order of 15 million tons per annum. The actual exports of iron ore in 1959-60 were of the order of 2·8 million tons and these are expected to go up to 4·0 million tons in 1960-61. In addition, firm agreements have been entered into with Japan for export of additional six million tons a year. The total estimated export of 15 million tons in 1966-67 would be distributed between the principal buyers as follows: Japan, 10·5 million tons consisting of 6 million tons from Bailadilla and Kiriburu and 4.5 million tons of normal purchases: Czechslovakia, 2.0 million tons; other Eastern European countries including Poland, 1.5 million tons, Italy 0.5 million tons and other Western European Countries 0.5 million tons. It was noted that only very recently the Government of India had concluded an Agreement with the Japanese steel mills under which the latter had contracted to purchase 4 million tons of iron ore from Bailadilla in addition to 2 million tons from Kiriburu and the normal purchases which at

present are of the order of 2 million tons, that is, a total export of about 8 million tons per annum. This agreement relates to the period of 15 years commencing 1966-67. According to the information presented in Shri Sandilya's Note about the future expansion programme of the steel industry in Japan, it could perhaps be anticipated that the Japanese requirements of iron ore from India might exceed the figure of 3 million tons for which specific contractual arrangements have already been made. The estimated additional increase of 2.0 million tons in exports to Japan bringing the total to 10.0 million tons by 1966-67 is expected to be gradual. A bulk agreement for this additional quantity is not yet in sight. It is, however, understood that the working group on mineral ores set up by the Planning Commission had recommended for planning purposes a total export of 13 million tons by the end of the Third Plan period, including 4 million tons of Bailadilla ore and 2 million tons of Kiriburu. Having regard to all these facts the Committee feels that while there is a reasonable prospect about the iron ore exports reaching a figure of 13.0 million tons a year by 1966-67, their possible increase to 15.0 million tons a few years later if not by 1966-67, cannot be ruled out. As it is advantageous to develop port capacity ahead of needs, the Committee considers that it would be desirable to accept the figure of 15.0 million tons for the purpose of planning port development for the next 5 to 10 years.

Anticipated Port Capacity

2.4. The total capacity for handling iron ore likely to be available at all the ports including major ports in 1965-66, is estimated by Shri Sandilya at 12.4 million tons, including 6 million tons of Vizag. Port which will cater for Kiriburu and Bailadilla deposits. In respect of Paradip Shri Sandilya had assessed a traffic of 1·0 lakh tons on the basis of the present limitations of inland communications. The Committee is, however, of the view that with the development of transport links to Paradip Port and the development of a lighterage port at Paradip, it should be possible to export 2·5 lakh tons of iron ore in the first phase and 5.0 lakh tons in the second phase even without a rail link from Cuttack to Paradip and without an all-weather alongside port at Paradip. With the construction of Cuttack-Paradip rail link this port will be about 125 miles from high grade ore mines and will be an economical port for export of high grade ore. Examination of an integrated scheme from the mine to the port will be highly desirable.

2.5. As regards Karwar, the Committee was informed that the Government of India had recently approved widening of the road between Hugli and Karwar for two lane traffic and extension of this road right up to Hospet for all road movement. The S.T.C. was of the view that the long distance road haulage right from Hospet to Karwar will not be economical as compared to rail movement. Further the Committee feels that there are physical limitations to carrying large quantities of iron ore by road to Karwar, Tadri, Bilikere and other minor ports in the region. Considering these factors, the Committee came to the conclusion that Shri Sandilya's estimate of export of 7.5 lakh tons of iron ore through Karwar, Tadri, Bilikeri and other minor ports in the region was reasonable out of this the share of Karwar may be assessed at 5 lakh tons. As regards Mangalore, the Committee noted that, with the construction of the Hassan Mangalore Railway line, the high grade ore mines of

Chitaldrug and Tomkur districts would be about 235 miles from Mangalore and the low grade ore mines of Babubudan with their principal point Kemmangundi about 200 miles from Mangalore. With the construction of the Railway line Mangalore would be according to Sri Sandilya an economical port in India for export of both high grade and low grade ores.

2.6. Considering all the above factors the following targets of exports of iron ore to various ports may be kept in view for port development.

Port	Export of ore to be handled per year	Remarks
(1)	(2)	(3)
	lakh tons	
Paradip	2·5 to 5·0	The development of the port will depend on the development of inland transport communications for bringing ore from the mines. Further development of the port will depend on the construction of rail link.
Kakinada	2·0	
Masulipatnam	3·0	
Cuddalore	5·0	
Mangalore	20	This depends upon the construction of the Mangalore—Hassan line. Without this the port will handle about 2·5 lakh tons only.
Karwar	5·0	
Redi	5·0	

2.7. With the above development and those contemplated in respect of major and minor ports the ore exporting capacity of all the ports in India by 1966-67 may be assessed as under:

Port	Capacity anticipated in five to ten years	Remarks
(1)	(2)	(3)
	lakh tons	
Calcutta	7·5	Though the port capacity is expected to be 7·5 lakh tons a year the port may not be able to get this much quantity due to congestion of railway lines from mines to the port.
Paradip	2·5 to 5·0	
Vizagapatnam	60·0	
Kakinada	2·0	
Masulipatnam	3·0	

(1)	(2)	(3)
Krishnapatninam . . .	1·0	
Madras	20·0	This is not free from doubt but is accepted for the present.
Pondicherry	2·0	
Cuddalore.	5·0	
Cochin	1·0	This figure is limited due to restricted rail capacity.
Mangalore	2·5 to 20	2·5 lakh without rail link, 20 lakhs with railway line.
Belikeri, Coondapore, Tadri, Honavar . .	2·5	
Karwar	5·0	
Redi	5·0	
Bombay	5·0	
Kandla	2·5	
TOTAL	126·5 to 146·5	lakh tons per year.

2.8. While there is a reasonable prospect of 130 lakh tons of iron ore export a year by 1966-67 but this is likely to go up to 150 lakh tons in a few years later. In view of this the Committee considers that the development of intermediate ports to bring the total capacity of the country to about 150 lakh tons in the next five to ten years as reasonable. The manner in which the various ports should be developed to achieve the above targets has been dealt with in subsequent Chapters of this Report.

Chapter III

ORISSA STATE

Introduction

3.1. The State of Orissa on the East Coast of India, lies between 17°-30′ and 22°-23′ north latitudes and between 81°-7′ and 87°-29′ east longitudes and has a coast line of 270 miles in length. The territory of the State may be divided into 4 well defined tracts each having its own characteristics; the northern plateau, the eastern ghats region, the central tract and the coastal planes along the Bay of Bengal.

3.2. The State is one of the richest in India in mineral wealth. Expensive high grade iron ore deposits are found in the districts of Keonjhar, Sundergarh and Mayur Bhunj. The deposits are stated to be over 1,600 million tons. Coal is available from the Ib, Rampar, and Himgir collieries. Large deposits also occur at Talcher, some 64 miles from Cuttack. The reserves are estimated to be 185 million tons for Talcher and 140 million tons for Rampar. The manganese ore deposits of Orissa are located in Gangapur, Koenjhar Bonai, Patna and Kalahanadi Districts. The reserves are estimated to be over 10 million tons. The State also possesses various other minerals including chromite, graphite, vanadium, titanium, bauxite, quatzite and fire-clay. Lime stone and other calcarious rocks suitable for the manufacture of cement also occur in the districts of Sundergarh and Sambalpur. Out of the rich variety of minerals in the State, mainly iron ore offers possibilities of being exploited for large scale foreign exports through a suitable port in Orissa.

3.3. At present Orissa is essentially an agricultural State. The main produce is paddy, which is mainly grown in the deltaic and coastal regions of the State. The total production of rice in the State during 1956-57 was 2,270,000 tons. The State is surplus in rice for which a ready market is available in Calcutta. Most of this surplus goes by rail, but a part is exported by the sea route to Calcutta *via* Chandbali Port. Other principal produces of the State are sugarcane and jute.

3.4. The Hirakud Dam Project has laid the foundation for the future development of the industries in the State. A new steel plant at Rourkella is now in commission. With the development of power and the commencement of steel production, the nucleus for development of heavy industries in this region has already been laid.

3.5. The State has at present no intermediate port. With the future possibilities of sea-borne traffic, the State has created recently a strong port organisation for the development of Paradip Port for the export of iron ore in large quantities. The organisation is headed by a Port Commissioner with an Assistant Director in charge of Navigation. A qualified Port Officer has been appointed to manage the day to day working of Paradip Port.

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THE PORT OF PARADIP

General

3.6. In 1951, a French Mission of Consulting Engineers at the invitation of the Central Government, undertook a study amongst other things for determining the most suitable site in the Orissa coast for a deep-sea port. Three sites, namely, the Devi River, the Mahanadi River and the Dhamra River were examined by the Mission who finally came to the conclusion that the most favourable site for a deep sea port is the Mahanadi River. The Mission visualised the port facilities to be located in the estuary with an approach channel dredged from the sea over the bar and protected by two parallel breakwaters on either side. Three alternative alignments for the breakwaters were suggested by the Mission. They had also recommended that a model study should be undertaken before selecting the final alignment. A Japanese mission also made a study of the port and performed model experiments at Tokio University. They recommended a coastal port just south of Mahanadi estuary connected with Mahanadi by a lock. In the meantime, on the advice of the Government of India, the State Government decided to develop Paradip in stages. Paradip was declared a minor port in January, 1958. Iron ore shipment from that port was commenced in that year with temporary facilities.

Traffic pattern

3.7. The only traffic at Paradip at present is the export of iron ore of the order of 40,000 tons from the Sukinda-Tomka mines. The output of these mines is of the order of 3½ lakh tons per annum. The bulk of this ore is exported through Calcutta port due to inadequate transport facilities to Paradip Port. The iron ore deposits in the Sukinda-Tomka region which have been actually surveyed are estimated to be 130 million tons. The iron content of the ore presently being mined at Tomka is almost 65 per cent.

3.8. The movement of iron ore from the mines to Paradip port is at present effected by two alternative routes. During the fair-weather season when the river Brahmni is dry, the ore is transported by trucks from the mines across the Brahmni River over a temporary bridge constructed each year after the south-west monsoon floods to the canal head at Jenapore for a distance of 33 miles. There is a proposal under the consideration of the State Government to construct a new road from Tomka to Kabatbandh, the site of the temporary bridge, which will shorten the distance from the mines to the canal head at Jenapore to 24 miles. The ore is transported from Jenapore in dumb canal boats manually propelled through the High Level Canal Range I and through either the Kendrapara Canal or the Taldanda Canal to the Mahanadi estuary. In the fair-weather season, the canal boats go through the Mahanadi estuary to the ore dumps near the mouth of the Mahanadi from where the ore is shipped using sea-going lighters towed by tugs and L.C.Ts. These crafts are loaded from temporary wooden jetties constructed from the shore. In the monsoon season, the currents in the estuary are too swift and the waves too strong for the canal boats. During this season, the ore is therefore dumped near the canal terminals to be taken to the port site in the fair season. The second alternative

route which is utilised during the monsoons when the Brahmni temporary bridge is removed is for the ore to be brought by road to Jajpur Road railway station, a distance of 22 miles and then by rail across the Brahmni river through the existing railway bridge to Cuttack. Thereafter, the ore is brought through Taldanda Canal in canal boats in the same manner as before. The present cost of transport of iron ore from the Tomka mines to F. O. B. Paradip Port as given by the State Government is Rs. 39·92 *via* the Janapur route and Rs. 38·30 *via* Jajpur Road as per details given in Appendix XI attached to this report.

3.9. The present lines of communications and mode of transport of iron ore from the mines to the port are not at all satisfactory. If these are improved, Paradip will become the natural outlet of the mines in the Tomka-Sukinda region. To enable this being done, a rail link from the mines to the main railway line and the necessary doubling of the main line and failing this a good road connection from the Sukinda-Tomka mines to the canal head at Jenapore with a road bridge over the Brahmni River will be required. The first alternative will enable the ore to be brought to Cuttack and loaded in canal boats at this place. This will enable the same craft to carry twice the quantity of ore to the port and will avoid the difficult crossings of Birupa and Mahanadi rivers. With the railway connections from mines to the main railway line it will be necessary to provide railway sidings on the canal banks near Cuttack. The second essential link will be the extension of the Taladanda Canal from Paradip lock where it terminates at present to Atharabanki Creek where the port facilities will be located as hereinafter explained. This will enable the iron ore to be moved directly from the canal head at Jenapore or Cuttack to the port site even during the monsoon when the river is in floods and inland water transport by canal craft is not possible in the estuary. In addition, the main inland water transport routes comprising the High Level Canal Range I, the Kandrapara Canal and the Taldanda Canal if rail link is not provided or only Taldanda Canal if rail link is provided will have to be improved to take additional traffic. The Taldanda Canal links up Cuttack and Paradip, a distance of 52 miles. It has a width of 40 ft. at bottom and a water depth of about 4'-6". It also has a head-lock of 115' x 17' wide and six other locks, each 100' x 17' wide. The High Level Canal Range I connecting Cuttack with Jenapore is 33 miles in length. It has a bottom width of 60 ft. and a water depth of six feet with two locks each 150' x 17' wide. The Kendrapara Canal takes off from the pool upstream of the Birupa anicut and it has its out-fall in the Jambo River, at a point 10 miles from Paradip Port. This canal is 40 miles in length with a bottom width of 40 to 50 ft. and a water depth of 6 ft. There are 8 locks on this canal, the minimum dimensions being 100'x17' wide except the head lock at Jagatpur which is 150' x 17' wide. Only Taldanda or all the three canals will have to be widened and deepened to make them suitable for two way traffic for 100 ton capacity canal barges. The sides will have to be protected against the wave-wash caused by mechanised craft. All the locks will also have to be lengthened, deepened and widened to 250' x 30' x 7' depth over the sill. It will also be necessary to acquire an adequate number of lighters and tugs for the transport of iron ore from the canal head to Paradip. If a rail link from mines is not provided a fleet of lorries will also be required for transport of ore from the mines to the canal head. With the improvement to the inland water transport and rail or road transport suggested

herein, there will be no difficulty in moving 5 lakhs tons of iron ore to Paradip Port.

Future traffic

3.10. The Committee visualises the export of 2.5 to 5 lakh tons of iron ore per annum through Paradip port within the next few years. In addition, during this period it is reasonable to expect an export of 50,000 tons of steel tubes now being manufactured near Cuttack, rice and other general cargo. The Committee is, therefore, of the opinion that a traffic of 3.0 to 5.50 lakh tons per annum at Paradip can be expected provided the lines of communications to Paradip Port are improved as suggested in this report. This traffic can be handled in a lighterage port at Paradip.

3.11. When the traffic at Paradip reaches the figure of 5.50 lakh tons per annum it may be necessary to provide an-all-weather port at Paradip. At this stage it will also be necessary to provide a rail link from Cuttack to Paradip and from Tomka mines to the main railway line somewhere east of the Brahmini if this is not done earlier. Rourkela Talchar line when it comes will also help the development of Orissa State and the Port but this need not be an essential pre-requisite for making Paradip into an all-weather port.

Engineering features

The river Mahanadi

3.12. From Naraj, the River Mahanadi enters the delta stretch after dividing itself into a large number of branches. The triangular delta covers approximately 150 miles of the coast-line from Chilka lakes to Dhamra river and has its apex at Cuttack 60 miles inland. The coast line is flat and covered with jungle. The main arm of the Mahanadi stretches past Paradip lock and enters the sea after flowing behind a long sand spit. The lower reaches of the river are 30 to 40 ft. in depth in stretches. During the dry season from about October to the beginning of June, head water discharge was insignificant, being of the order of 1,000 cusecs. This has increased due to the construction of Hirakud dam and may become about 8000 cusecs or more if there are no new withdrawals below Hirakud in dry weather. From the beginning of June to the end of September, however, the discharge of the monsoon freshes is of the order of 400,000 to 500,000 cusecs, the influence of the tide during this season being almost negligible. In proportion to the increase of discharge the river also carries a large quantity of materials in suspension, of the order of about 28 million tons. During the dry season, the tidal discharge in the mouth is estimated to be 1,00,000 cusecs at springs and 60,000 cusecs at neaps. The tidal range in the estuary of the Mahanadi is of the order of 6 to 7 ft. at springs and about 4 ft. at neaps.

3.13. In common with other rivers on the east coast the Mahanadi exhibits characteristics of continuously shifting its mouth from south to north. This movement of the mouth is caused by the intense littoral sand drift along this coast. The movement of the mouth towards the north causes a sand spit to be formed. After a certain stage is reached when the river has travelled far to the north, the dynamic equilibrium

of the various marine forces is upset and the river makes a fresh burst at the base of the spit. In 1950 the mouth of the Mahanadi was roughly 6 miles east of False Point light-house but in 1952 the river burst through the base of the spit 9 miles south of the old mouth. Since that date the mouth is travelling northwards at the rate of about half a mile in 4 years.

Littoral sand drift

3.14. One of the main features of the east coast from as far south as Nagapattinam and extending up to Orissa coast in the north is the littoral sand drift. During the south-west monsoon period, the strike of the waves is from the south-east making approximately an angle of 30° to the shore. The littoral currents during this season are also from the south to the north. Due to these two forces acting in unison, there is a drift from south to north during this season. During the north-east monsoon season, however, the approach of the waves is from the north-east making again an angle of approximately the same magnitude with the shore. The currents during this season are southerly. During this season therefore there is a sand movement to the south. Due to the preponderence of the south-west monsoon season, however, the nett result is a northward movement of sand estimated to be in the region of 1 to 1.5 million tons per annum on the basis of available figures from the ports of Madras and Vizagapatnam. This sand movement is of considerable importance in the construction of any harbour structure projecting into the sea. Any solid structure built into the sea will stop the nett northward movement of sand resulting in beach building on the south side of such a structure, eventually enveloping it and erosion on the north side. This sand will also fill up any approach channel dredged from the sea to the coast. Constant dredging in the south, right from the construction of the coastal harbour will, however, reduce the building up of the coast but is not likely to stop it completely.

Cyclones

3.15. The Bay of Bengal is well-known for the occurrence of cyclonic storms during the transitional seasons between the monsoons, namely, May, October and November. Some of these cyclones are of exceptionally heavy intensity which have in the past caused destruction in the east coast harbours. In November 1916, for example, the breakwater head at Madras Harbour which weighed 5,000 tons was dislodged by a cyclone. In 1952 again in November a cyclone completely demolished a steel pier at Pondicherry Port. Several other cyclones causing extensive damage to coastal towns have also been reported in the past. Another feature of these cyclones is the piling up of water in the storm area. This advances with the storm and strikes the coast as storm waves. If the occurrence of the storm waves coincides with high water, inundations of vast areas may occur, the water level rising sometimes even to 30 ft. above high water in a few minutes.

Winds

3.16. The outstanding feature of the wind system in the Bay of Bengal near Paradip is the seasonal reversal of direction known as the

monsoons. Between the two main monsoon seasons, there are two transitional periods making in all 4 seasons into which a year may be divided for describing the prevailing wind directions:

(a) *North-east Monsoons.*—During this season from about December to March, the prevailing winds are north-easterlies attaining strengths up to 4 in the Beaufort Scale.

(b) *Hot weather period.*—This period extends from April to May, this being the transitional period of preparation for the south-west monsoon. The winds during this season usually come from the south-west attaining forces up to 3 or 4 in the Beaufort Scale. During this period occasional north-west winds are still a feature of the Orissa coast.

(c) *The south-west monsoon season.*—This period starts from about June and continues up to September when south-west wind of oceanic origin blows steadily. The strength of this wind is generally from 4 to 5 in the Beaufort Scale but on occasions may reach up to 9 or 10.

(d) *The Transitional monsoon period.*—During this period in October and November the south-west winds of oceanic origin retreat southwards and are replaced by northerly winds of land origin. The month of November is specially vulnerable for the occurrence of cyclones.

(e) *Sea and land breezes.*—Besides the seasonal winds described above, there are local and seasonal winds along the coast, the most important of which being the sea and land breezes. These breezes are most pronounced during the dry sunny weather of the north-east monsoon season.

Model experiments

3.17. The Poona Research Station at the invitation of the Orissa Government have carried out model studies as recommended by the French Mission for developing Paradip into an all-weather estuary harbour. In view of the huge sediment load carried by the Mahanadi and its unsteady mouth, the Research Station carried out further experiments for an entirely artificial coastal harbour 3½ miles south of the Mahanadi mouth. The Research Station have completed these experiments and have evolved a suitable alignment of breakwaters for the entirely artificial coastal harbour. The Research Station recommended this scheme for an artificial coastal harbour in preference to the estuary harbour scheme favoured by the French Mission. This scheme is shown in Drawing No. IPDC/2.

Port development

3.18. Any proposal for development of Paradip as a minor or an intermediate port will have to take into consideration the final shape of the future all-weather port, as the facilities now provided will have to synchronise with an all-weather port of the future. Technical studies and comparative estimates for the estuary harbour and the coastal harbour suggested by the Poona Research Station were, therefore, made in the Ministry of Transport. These studies indicate the feasibility of constructing an all-weather port in Atharabanki Creek near the Mahanadi

estuary which will combine the advantages of the estuary harbour suggested by the French Mission and a coastal harbour recommended by the Poona Research Station. In essence, the proposal is to dredge an independent approach channel from the sea to the creek known as Atharabanki Creek lying to the south of the Mahanadi river. The creek will be blocked at its junctions with Mahanadi and a turning basin and berths will be located in the creek. The entrance works will be on the Vizagapatnam model with an off-shore breakwater and a sand trap situated on the lee of the breakwater. The littoral drift which is one of the main problems of developing any port on the east coast, will be made to deposit in the sand trap from where it may conveniently be dredged and deposited on the north side of the approach channel or some distance away in the sea as found necessary.

3.19. The advantages of this scheme are enumerated below:

(a) The scheme is capable of phased development. The lighterage facilities required at present can be developed in the creek and all other port structures, colony and roads can be so planned as to form a part of the all-weather port project. The site suggested by the Poona Research Station for the coastal harbour is not capable of being developed in phases.

(b) The port is located well inside, protected from cyclones and winds by thickly wooded land. An artificial coastal harbour will be entirely open and less safe for vessels during cyclones.

(c) In capital cost it is cheaper than the estuary harbour and the coastal harbour. The estimated cost of the three types of the harbour as worked out in the Ministry of Transport are:

(i) Coastal harbour	Rs. 13·7 crores
(ii) Estuary harbour	Rs. 13·5 crores
(iii) New proposal	Rs. 9·5 crores

(d) The problem caused by the sediment load of the Mahanadi river and the formation of the bar at the mouth of the river in the case of an estuary harbour is practically eliminated and in this respect the port will behave like the coastal port.

(e) By the construction of a lock entrance costing about Rs. 2 crores, the Atharabanki creek can at a later date be connected to the deep frontage of the Mahanadi estuary almost a mile in length. This stretch of the river maintains at a natural depth between 30 ft. to 40 ft. below L.W.O.S.T. without dredging. Considerable scope for future expansion for any number of additional berths, moorings, shipbuilding yards, oil refinery, naval base, etc. is therefore available.

3.20. In view of these advantages the Ministry of Transport have requested the Poona Research Station to carry out model study in respect of this new scheme.

3.21. The Committee after examining the various proposals for a deep sea harbour at Paradip is of the opinion that the proposal to construct a deep-sea port in Atharabanki Creek is the most satisfactory proposal from all aspects. The plan for this proposal as slightly modified by the Committee to make the approach channel further south than originally proposed is shown in drawing No. IPDC/2. This plan provides space for about 20 berths in Atharabanki Creek and allows for provision of additional berths in the Mahanadi as a very long term measure.

3.22. For handling a traffic of 2.5 lakh tons, the Committee recommends in the first instance development works costing Rs. 99 lakhs to be given first priority as per details given in Appendix X. The main items of works include the construction of a lighterage wharf; provision of cranes, trolly lines, platform cars, ore tubs and nets for handling iron ore; the acquisition of sea-going lighters and tugs for shipping iron ore; the construction of essential staff quarters and office buildings; the provision of repair facilities, water supply, electricity and navigational aids; and the acquisition of a 12" cutter suction dredger for internal dredging.

3.23. As the traffic increases up to 2·5 lakh tons and there is indication that the anticipated traffic of 5.5 lakh tons per annum is likely to be achieved it will be necessary to acquire additional tugs, lighters and mobile cranes, etc. These works which may be given a second priority are estimated to cost Rs. 55.3 lakhs as per details given in Appendix X.

3.24. Any further increase in cargo at Paradip will necessitate the development of Paradip into an all-weather port. The cost of such a scheme with one mechanical ore loading berth and four all-weather moorings is estimated to cost roughly Rs. 9·5 crores.

Economics of port development

3.25. The economics of port development at Paradip estimated to cost Rs. 154·3 lakhs for both the first and second priority works for handling 5 lakh tons of iron ore have been studied by the Committee. At Paradip the entire transportation of iron ore from the mines to Paradip and the stevedoring at Paradip are controlled by the State Government. The Committee came to the conclusion that this development will yield a nett annual return of about Rs. 4,75,000 being 3 per cent of the capital on port development allowing for interest on capital and depreciation of assets, as per details given in Appendix XII attached to this report. The Committee has not examined the economics of the inland transport.

CHAPTER IV

ANDHRA PRADESH

Introduction

4.1. The State of Andhra Pradesh located between 15° and 20° North latitudes and 78° and 85° East longitudes has a cast-line of 600 miles facing the Bay of Bengal. Extending over part of the Deccan Plateau and the eastern sea board, the territory of the State generally comprises the up lands in the west sloping down to fertile deltas in the east. The State is rich in agricultural production, the Godavari and the Krishna, deltas being of the most fertile in the country producing surplus rice, a part of which finds an outlet through the ports of the State for coastal distribution. Tobacco is also grown in large quantities in the Guntur District, a part of which is exported to foreign countries through these ports.

4.2. The principal industries in the State are cotton textiles, jute, sugar, paper, cement, cigarettes, rice milling and vegetable oil production. None of these industries, however, generate any appreciable traffic through the ports of the State.

4.3. The State is also rich in several minerals. The principal minerals exploited in the State are iron ore, manganese, coal, mica, lime stones, asbestos and barytes. Out of these only iron ore and small quantities of barytes pass through the ports. Though the previously exploited local depoists of iron ore, especially those near Vijaywada, are gradually getting depleted, it is reported that fresh deposits have been located in different areas of the State.

4.4. The State of Andhra Pradesh has two intermediate ports, Kakinada and Masulipatnam. The bulk of the traffic handled at these ports at present is iron ore coming from the Bellary-Hospet region of Mysore and some from the Bairam mines in Andhra Pradesh. In addition Kakinada has a traffic of tobacco, fertilizers, foodgrains and fibre. These two ports are connected to the railway, road and inland water transport systems of the State.

4.3. The minor and intermediate Ports of Andhra Pradesh are managed by a Minor Ports Organisation under a State Port Officer with headquarters at Kakinada. The State Port Officer is also the Marine Adviser to the State Government. A Harbour Sub-Division, under an Assistant Engineer, carries out the design, construction and maintenance of all civil engineering works at the ports. The maintenance of floating craft and plant is carried out by a Mechanical Engineer and Dredging Suprintendent. The State Port Officer also functions as Port Officer of Kakinada port. Masulipatnam has a qualified Resident Port Officer working under the State Port Officer.

The Port of Kakinada

General.

4.6. The Port of Kakinada, an all-weather lighterage port, is situated in Kakindada Bay, north of the Godavari River mouth in the shelter of the Godavari sand spit. It is roughly 80 miles south of Vizagapatnam and 370 miles north of Madras. It is the most important intermediate port of Andhra Pradesh. The port facilities at Kakinada are located on the left bank of the Kakinada canal, 2½ sea miles up-stream from Kakinada Bay. Drawing No. IPDC/3., shows the general layout of the port of the Kakinada. A list of the port facilities at Kakinada is given in Appendix VII attached to this report.

4.7. The port was very prosperous and thriving before World War II, the main items of trade then being the export of groundnuts and the import of petrol ad mineral oil. The port was closed to traffic during the war and in the post war years the trade of the port dwindled to about 60,000 tons per year; roughly 30 per cent of the pre-war figures. This was due to the prohibition places on the export of groundnuts and the shifting of oil trade to Vizagapatnam port. Since 1952, however, Kakinada recovered much of its pre-war tonnage of traffic with a new trade in the export of iron ore.

Traffic Pattern

4.8. The port of Kakinada from 1954-55 to 1957-58 handled a traffic of the order of 3·5 lakh tons per annum, registering a steep rise since 1954-55 due to iron ore exports. In this period sailing craft traffic steadily fell from 59,000 tons in 1954-55, to 750 tons in 1957-58. Thus in 1957-58 out of the total traffic of 3·4 lakhs tons, sailing craft traffic accounted only for a fraction of one per cent of the total traffic. The port traffic registered a sharp decline in 1958-59 mostly due to the exhaustion of iron ore in the mines of the Jaggayapet region situated close to the port. The volume of traffic per annum handled at Kakinada from 1950-51 to 1959-60 and the number and nett registered tonnage of steamers and sailing craft which visited the port during this period are given in Appendices VIII & IX of this report.

4.9. The main traffic at Kakinada is the export of iron ore from the Bellary-Hospet region and from the Jaggayapet mines near Vijaywada. The Bellary-Hospet ore is brought by rail to Kakinada, a distance of 484 miles from Hospet and 443 miles from Bellary, the rail freight being Rs. 25.30 nP. from Hospet and Rs. 23.67 nP. from Bellary This route involves one transhipment at Vijaywada from metergauge to broad-gauge though the Railways do not charge for this transhipment as per their existing rail freight rules. The ore from the Jaggayapet mines are brough by road to the canal head at Vijaywada, a distance of 52 miles and there after by inland water transport to Kakinda for a distance of 125 miles The fall in iron ore traffic is mainly due to the reserves at Jaggayapet mines being exhausted. Since last year, however, small quantities of iron ore from the Bairam mines in east Andhra Pradesh find an outlet through Kakinada. This port is a very efficient port for iron ore exports due to its well sheltered nature and the availability of an ample number o lighters, the maximum shipping rate achieved on a single steamer being 3960 tons per day.

4.10. Amongst the miscellaneous cargo which accounts for 48 per cent. of the traffic at Kakinada in 1958-59, are the foreign exports of tobacco, palmyrah fibre, bones, horns and rice bran, the coastal exports of sugar and rice to Calcutta and Cochin the foreign imports of wheat, ammonium sulphate and fertilisers and the coastal imports of miscellaneous cargo and oil from Madras. These cargo generally originate from or, destined to the various districts of Andhra Pradesh.

Future Traffic

4.11. The Bellary-Hospet mines are over 400 miles distant and the transport of iron ore to Kakinada involves a break of gauge at Vijaywada. The proved deposits in iron ore in Andhra Pradesh are not very large. The Jaggayapet mines are already exhausted. The other mines which may serve Kakinada are the Bairam mines in the eastern part of Andhra Pradesh. The reserves here also are not expected to be large. There is, however, a prospect of developing an export trade in the magnetite type of iron ore which is largely found on both the banks of the Godavari river. The Japanese have indicated that they may be interested in the purchase of magnetite ore with an iron content of over 55 per cent. instead of the usual haematite ore now being used by the steel plants as a result of a change of technology in their steel making. Preliminary surveys have indicated that the magnetite on the banks of the Godavari river is rich in iron with the iron content between 60 to 62 per cent. The extent of these iron ore reserves and their detailed qualities are not yet known. Subject to these being satisfactory, there is a good prospect of transporting this ore by inland water transport and exporting through Kakinada. The State Trading Corporation expects an export trade of 5 lakh tons of iron ore through Kakinada, and Masulipatam in the next few years out of which Kakinada's share may be taken as 2 lakh tons per annum.

4.12. The Committee is also informed that the State Government is proposing to put up a fertiliser factory at Kothugudam. An import of roughly one lakh tons of rock phosphate required for this factory is expected to be imported from foreign countries. Kakinada and Masulipatam ports may both be utilised for this purpose. Kakinada's share may be of the order of 50,000 tons in this traffic.

4.13. In virtue of its commanding position in the Godavari delta, rich in the production of food-grains and tobacco, it is reasonable to expect an export of 30,000 tons of tobacco and 50,000 tons of rice and miscellaneous general cargo and an import traffic of the order of 50,000 tons of miscellaneous cargo through Kakinada in the next 10 years.

4.14. On the basis of the above estimates, the Committee visualises a traffic of the order of 4 lakh tons per annum in the next 10 years consisting of the export of 2 lakh tons of iron ore, 30,000 tons of tobacco, 50,000 tons of rice and 20,000 tons of miscellaneous cargo and the imports of 50,000 tons of rock phosphate and 30,000 tons of miscellaneous cargo per annum.

Engineering Features

4.15. Kakinada (Cocanada) Bay is the safest natural harbour on the whole of the east coast of India. It is formed by a sand spit known as the Godavari spit. An arm of the Godavari debouches into this Bay. A comparison of later hydrographic charts with that of 1789 show that

the spit has advanced in a northerly direction for a distance of 12 to 13 miles at the rate of nearly a mile a year in the initial stages thus enveloping and protecting Kakinada Bay. The curves of the development of the spit during successive years show that the spit has definitely tended towards a westerly progress in recent years and have almost reached a state of equilibrium. The hydrographic surveys of 1857, 1891, 1911, 1924 and 1942 are shown superimposed in Drawing No. IPDC/3, attached to this report.

4.16. The entrance of the Kakinada Canal into the Bay was originally protected by a pair of parallel groynes built in 1891. These groynes had to be extended periodically in 1914, 1924 and 1942 as shown in Drawing No. IPDC/3, to prevent the advancing northern shore line from outflanking the northern groyne and choking up the approach channel for lighters and tugs. From the study of the quantity of silting from 1857 and 1956 it is found that approximately 2 lakh tons on sand on an average is deposited yearly on the northern side of the north groynes whereas the shore line on the sourthern side of the entrance remains stable.

4.17. A comparative study of the bed material in the Bay, the Godavari spit, the coast on the north of the Bay and that immediately on the north and south of the Kakinada canal mouth indicates that the bed material of the Bay as well as the bed material south of the groynes along the coast consists of soft clay, whereas, the material of the Godavari spit and the coast north of Kakinada Bay extending right up to the north groyne consists of fine sand. These observations lead to the conclusion that the prevailing littoral drift of sand along the Godavari spit is carried to a point beyond the Kakinada Bay during the south-west monsoons without the material actually entering the Bay itself. During the north-east monsoon, however, the southward drift along the main coast carries the littoral sand along the western coast of the Kakinada Bay to get traped by the projecting groynes at the mouth of the Kakinada Canal. Since the Bay is protected from the south and east, the predominent south-west monsoons have no effect inside the Bay to shift back the material brought down during the north-east monsoons along the prevailing northerly direction of drift on this coast. This explains the reason why the coast line north of the groynes is steadily advancing.

Port Development

4.18. The Committee feels that considering the importance of Kakinada, this port should be modernised and improved to handle efficiently an annual traffic of 4 lakh tons of cargo forecast by the Committee. This may be achieved by taking up the development works enumerated below. The advancing coast line on the north of the entrance groyne is now threatening to out-flank and choke up the approach channel to the port. This problem can be tackled in two ways. If a sand trap is made on the north of the approach channel, the amount of sand accumulated year by year may be dredged to keep the channel clear. The annual amount of dredging involved in this scheme is of the order of 2 lakh tons which will involve an expenditure of Rs. 3 lakhs per annum for the port at a cost of Rs. 1·50 per ton of material dredged. Alternatively, the groynes can be further extended to the sea by 1000 ft. which from the previous

rate of advance of the coast line will protect the channel for some 20 years. This second alternative will involve a capital expenditure of Rs. 8 lakhs as against a recurring maintenance expenditure of Rs. 3 lakhs per year for the next 20 years in the first alternative. The Committee therefore, recommends this work for immediate execution. In addition to this work, other items of works immediately required at Kakinada are: the replacement of the existing Cutter Suction dredger which is more than 40 years old; the acquisition of an area known as "Floating Dock" area for use as a fishing-*cum*-ore dock; the development of "Loading Hard" area as a lighterage berth for general cargo; the provision of night navigational aids for steamers and lighters; and the construction of three numbers R.C.C. T-headed jetties for iron ore. The total estimated cost of these works which should be given first priority for Kakinada Port is Rs. 25,00,000 as per detailed breakup of costs given in Appendix X. The Committee also considers that certain additional works are also necessary, though this may be given a second priority. These works include the acquisition of a new grab dredger with two hopper barges of 100 ton capacity, the contruction of essential quarters for port staff, the reconditioning of the tug "Godavari" and the conversion of the ports M.F.V. as a despatch vessel. The total estimated cost of these works is Rs. 9,00,000 as per details given in Appendix X.

The Port of Masulipatnam

General.

4.19. The port of Masulipatnam is located about 195 miles north of Madras on the Bay of Bengal. It is the Second most important intermediate Port of Andhra Pradesh. The shore facilities are situated on the left bank, of a tidal channel known as Salt Creek, roughly 6 miles from its mouth. This creek is connected to the Krishna River through Masulipatnam Canal. A pair of lock gates near the wharf protects the canal against the entry of salt water from the creek. Drawing No. IPDC/4 shows the layout of the shore facilities at Masulipatnam. Appendix VII lists the existing port facilities at Masulipatnam.

4.20. During pre-war days export of groundnuts was an important feature at this port but this trade, declined to after the war due to the export restrictions on this commodity. Since 1952, however, much of the trade that was lost was recaptured and in fact improved with a new trade in iron ore through Masulipatnam.

Traffic Pattern

4.21. The trade at Masulipatnam port which is almost entirely carried by steamers, increased rapidly from a figure of 16,000 tons in 1950-51, to 66,000 tons in 1954-55. This marked the begining of iron ore export through Masulipatnam. During 1955-56, the increased traffic in iron ore mainly accounted for the sharp rise in traffic to 2,26,000 tons. For the next three years the port maintained this traffic reaching a maximum of 2,71,000 tons in 1956-57. During 1958-59 the traffic showed a decline, the tonnage handled being 1,40,000 tons, mainly due to the depletion of iron ore in the Jaggaypet mines, one of the areas being served by Masulipatnam. The volume of traffic handled per annum at Masulipatnam from 1950-51 to 1959-60 and the number and the nett

registered tonnage of steamers and sailing craft which visited the port during this period are given in Appendices VIII & IX attached to this report.

4.22. The main traffic at Masulipatnam is iron ore, this accounting for over 99 per cent of the peak cargo in 1956-57. This iron ore originates from Bellary and Hospet and the Jaggaypet region near Vijaywada. There is a through meter-gauge line connecting the mines at Bellary and Hospet to the port. There is, therefore, a great advantage in using Masulipatnam Port for the export of ore. The distances from Masulipatnam Port to Bellary and Hospet by rail are 360 and 401 miles respectively, the railway freights being Rs. 20.40 and Rs. 22.31. The ore from the Jaggaypet mines is brought by road for a distance of 52 miles to Vijaywada Canal head by lorries and then transported by canal for a distance of 45 miles to Masulipatnam Port. Amongst the general cargo handled at Masulipatnam, the main items are the imports of fertilisers and the exports of rice.

Future Traffic

4.23. Masulipatnam is located at a distance of over 360 miles from the mines of Bellary and Hospet. The Jaggaypet mines from which a large proportion of the iron ore export through Masulipatnam originated, had already been exhausted. The only other mine in Andhra Pradesh at present which may be served by Masulipatnam port is the Bairam mines in east Andhra Pradesh. The reserves of these mines, however, are not large. New iron ore deposits have also been found in Khamam in the Telengana area of the State though the extend and quality of these deposits are not known. The State Trading Corporation expects an annual export of 5 lakh tons of iron ore through Kakinada and Masulipatnam from the Andhra Pradesh and Bellary-Hospet Mines in the next few year out of which Masulipatnam's share may be taken as three lakh tons of iron ore. In addition to this traffic, Masulipatnam may expect an import of 50,000 tons of rock phosphate per annum from foreign countries required for the proposed fertilizer factory at Kothugudam. The remaining 50,000 tons of rock phosphate required for this factory may, however, pass through Kakinada. In view of Masulipatnam's commanding location in respect of the Krishna Delta, rich in the production of food grains, it is also reasonable to expect a general cargo traffic of 50,000 tons including coastal rice exports. The Committee, therefore, visualises a total traffic of roughly 4 lakh tons per annum through Masulipatnam in the next 10 years.

Engineering Features

4.24. The main problem of Masulipatnam is the shallow and unsteady nature of the bar at the mouth of the Salt Creek. The depths over the bar are only of the order of 1 feet, below L.W.O.S.T. during the dry months, the range of tides being 4.5 feet at springs and 1.5 feet at neaps. Several lighters have been lost over this bar. The Masulipatnam lighters are able to cross the bar only at high tide and that too with a certain amount of risk. This limitation at Masulipatnam has restricted the number of round trips of lighters to one per day of 24 hours, thereby resulting in a reduced handling capacity for the port.

4.25. There is evidence of littoral sand drift at Masulipatnam, probably of the order of about one million tons per annum based on the figures obtaining at the ports of Madras and Vizagapatnam. This littoral drift is the result of the combined action of the oblique breaking of the waves on the beach and littoral currents. During the south-west monsoon period the strike of the waves is from the south-east, and the littoral currents are northerly. During the north-east monsoon period the strike of the waves is from the north-east and the current is southerly. During these two seasons there are sand drifts to the north and the south in the direction of the prevailing currents and waves. The preponderence of the south-west monsoon season, however, results in a nett average movement of about a million tons of sand per annum along the coast towards the north.

4.26. A comparative study of the hydrographic surveys of 1892 and 1958 indicates that the coast line at Masulipatnam has advanced for almost a mile at a rate of roughly 100 feet in a year. The bed contours of the sea off Masulipatnam, however, have not correspondingly advanced. The 1 and 3 fathom contours have advanced by 900 feet and, 1000 feet, respectively whereas the 2 fathom and four fathom contours have receded by 2700 feet and 2000 feet respectively during this period. This advance in the coast line is probably due to the sea-ward progress of the entire Krishna Delta.

4.27. In order to reduce the distance the lighters have to travel to reach the roads, the port authorities in 1943 utilised the Suction Dredger "Akhanda Godavari" to dredge a new channel at the base of the sand spit some 2½ miles south of the mouth of the Salt Creek. Due to the strong littoral drift from south to north, this opening gradually travelled northward at the rate of about 400 feet per annum. By 1952, the mouth occupied roughly the same position as it originally occupied in 1943. This also resulted in the formation of a new sand spit enveloping the old and more stabilised spit with a second channel between the two sand spits *vide* Drawing No. IPDC/4, attached to report. In 1958, during an exceptional tidal rise. this new sand spit breached at a place where the old cut was made by dredging in 1943. The Salt Creek thus has at present two mouths with the result that the depths over both the bars have further deteriorated due to the dissipation of the tidal prism in ebbing and flowing through two mouths.

4.28. The marine and physical features at Masulipatnam comprising the shallow nature of the bar, the intense littoral sand drift, the advance of the coast line, the lack of an adequate tidal prism, the flat gradient of the sea bed from the shore, the discharging of the silt laden waters of the Krishna River into Masulipatnam Bay during the south-west monsoon freshets and the location of Masulipatnam in the cyclonic area, all combine to make the problem of port development at Masulipatnam one of the most difficult in India.

Port Development

4.29. In order to cater for the expected traffic of 4 lakh tons of cargo efficiently and at the same time remove the risk to navigation by lighters, the mouth of the Salt Creek should be stabilized in one position. The best location for the stabilised mouth would be the old mouth. This will have the advantage of increasing the tidal prism. Secondly, the coast to the north of this mouth is fairly high and permanent. The old channel behind the old spit will also have to be suitably dredged and

trained to lead to the stabilised mouth. The old spit should also be strengthened where necessary to prevent any future breaching. This proposal of the training of the creek and the stabilising of the mouth is an item already included in the Second Plan. Drawing No. IPDC/1, shows the layout of these proposals. The Committee feels that this work estimated to cost Rs. 17,00,000 should be proceeded with and given first priority. For the improvement of the depths over the bar, the Committee is of the opinion that initially a sea-going Cutter Suction dredger from the proposed dredger pool under the Ministry of Transport should be utilised for dredging the bar and thus gain experience of the quantum of maintenance dredging that is involved to keep a channel having a depth of 6′ below L.W.O.S.T. open through-out the year. After actual experience of dredging with the help of dredger pool, the question of having a full time dredger for the port may be examined. After the old bar is stabilised it will be necessary to shift the iron ore dump in the first instance, and the entire port at a future date, to a site close to the stabilised mouth. This will reduce the distance the lighters will have to travel to reach the roads by 5 sea mines. The Committee also considered certain other items of development necessary for the modernisation and efficient working of the port. These are: the rivetment of certain eroding stretches of the creek, the material thus eroded contributing largely to the silting of the channel; the construction of a bridge and approach road to the proposed ore dump near the mouth; the construction of a small slipway and the provision of certain essential workshop equipment for the maintenance of port craft; the construction of essential quarters for port staff; and the reconversion of the Suction Dredger "Akhanda Godavari" to oil firing as originally designed by the builders, which had been converted to coal-firing some years ago by the Port Department resulting in loss of efficiency. The estimated cost of these works which may be given second priority is Rs. 14,80,000 as per details given in Appendix X.

4.30. The Committee is also informed that there is a proposal now under the active consideration of the Southern Railway for the conversion of the metre-gauge line connecting Vijayawada and Masulipatnam to broad-gauge. One of the advantages of the Masulipatnam port for the export of iron ore is that it has a direct metre-gauge link from the mines in the Bellary-Hospet region to the port. The conversion of a part of this link into broad-gauge will mean a break of gauge for iron ore traffic which forms the bulk of the cargo at Masulipatnam. The Southern Railway maintains that this conversion will give adequate facilities for the movement of rice from the Godavari Delta area to centres of distribution which are located mostly on the broad-gauge sections and that the outward traffic from the metre-gauge to the broad-gauge section is greater than the inward traffic to these areas from the adjoining metre-gauge sections by about 35 per cent. From the Railways point of view, therefore, the conversion will reduce the overall transhipment at Vijayawada. In discussions with the Committee the Railway representative assured the Committee that the conversion of the line to broad-gauge will not be allowed to hamper the export of iron ore through the port as the Railways would make adequate arrangement for transhipment of ore from metre-gauge to broad-gaugersion of the line to broad-gauge will not be levied for transhipment froort of iron ore through the port as the Railtransport will not increasee arrangement for transhipment of ore from accepts the position.

Chapter V

MADRAS STATE

Introduction

5.1. The State of Madras is the southern-most State of the Indian Union and lies between 76° and 80° 30′ east longitudes and 8° and 13° 30′ north latitudes. The State has an uninterrupted coast-line of 620 miles facing the Bay of Bengal, the Palk Strait, the Gulf of Manaar, the Indian Ocean and the Arabian Sea. The State can be divided into two well defined tracts, the vast flat country along the eastern coast line and the mountaneous region in the north and the west. The Eastern Ghats enter Madras State from Andhra Pradesh in the north and run-across the State till they merge with the Nilgiri ranges.

5.2. The principal crops grown are paddy, millets, ground-nuts, cotton and sugarcane. The total production of food crops during 1958-59 was 50 lakh tons. Timber, fuel, bamboos, sandalwood and tan barks are the main forest produces of the State. The agricultural and forest produces of the State other than onions in small quantity, find no outlet through the ports of the State.

5.3. Amongst the heavy industries located in the State, is the Neyveli lignite project now under construction. A thermal power plant and a fertilizer plant are also proposed to be started at Neyveli. One pig iron plant went into production at Coimbatore recently. Four more plants are expected to be started in the future. Other industries in the State are textiles, engineering, sugar, tobacco, matches, bricks and tiles, cement, lime, potteries, oil milling tanning, ginning and pressing. The State exports through Madras Port to foreign markets hides and skins valued at more than 11 crores of rupees per annum.

5.4. The State is rich in minerals. Important minerals in the State are lignite, mica, barytes, gypsum, bauxite, lime stone, china clay and magnesite. None of the mineral wealth of the State contribute at present to the sea-borne traffic of the State.

5.5. The Sate has three intermediate ports, Cuddalore, Nagapattinam and Tuticorin. The intermediate and minor ports in the State with the exception of Tuticorin port, are administered by the State Port Officer with headquarters in Madras City. The State Port Officer is assisted by a Port Officer at Nagapattinam and a Port Officer at Cuddalore. Tuticorin port is administered by a Port Trust with the assistance of a Port Officer and Secretary. There is a central Engineering Division with headquarters at Madras for carrying out the design, construction and maintenance of engineering works at the various intermediate and minor ports other than Tuticorin. The maintenance of mechanical plant and floating craft is undertaken by an Inspecting Dredging Engineer attached to the Minor Ports Organisation. At Tuticorin, there is a separate Engineering Sub-Division.

The Port of Cuddalore

General.

5.6. The Port of Cuddalore is situated at the confluence of the rivers Paravanar and Gadilam, roughly 85 miles south of Madras coastwise. It is one of the most important lighterage ports of Madras State. It is also one of the main ports of entry for coal required by the Southern Railway. During the last two years the port has developed an export traffic in iron ore from the Bellary–Hospet–Sandu region. The port facilities at Cuddalore which are listed in Appendix VII are located on the western bank of the Uppanar back water connecting the Paravanar and Gadilam rivers. Drawing No. IPDC/5 shows the lay-out of the existing port at Cuddalore.

Traffic pattern.

5.7. Cuddalore Port handled during 1959-60 a traffic of 4·13 lakh tons of cargo. The volume of annual traffic handled at the port of Cuddalore from 1950-51 to 1959-60 and the number and nett registered tonnage of steamers and sailing craft which visited the port during this period are given in Appendices VIII and IX of this Report.

5.8. The main traffic at Cuddalore at present is the import of coal required for the Southern Railway of the order of 1·2 Lakh tons and the export of iron ore of the order of 2·5 lakh tons. Miscellaneous other cargo handled at Cuddalore includes the exports of such items as cement from Dalmiapuram, sugar from the mills situated in the South Arcot District and magnasite from the factories in the Salem area and the imports of fertilizers, sulphur and foodgrains in lots of a few thousand tons under each category.

Future traffic.

5·9 The State Trading Corporation is proposing to utilise Cuddalore Port for the export of 5 lakh tons of high grade iron-ore from the Ballary-Hospet region. Cuddalore Port has the advantage over many other ports in handling this ore as there is no break of gauge in the metre gauge link between Bellary-Hospet and the port. The rail distance from Bellary and Hospet is 403 miles and 444 miles respectively involving a rail freight of Rs. 22·31 and Rs. 23·67. The metre-gauge railway line connecting Bellary, Hospet and Cuddalore is being strengthened by the Southern Railway to carry this additional traffic.

5.10. As far as coal traffic at Cuddalore is concerned, the present traffic is 1·2 lakh tons a year. If the present policy continues a traffic of the order of 1·0 lakh tons a year may be expected.

5.11. The Committee, therefore, visualises a traffic of roughtly 6·5 lakh tons at Cuddalore in the course of next 10 years comprising of 5 lakh tons of iron ore, 1·0 lakh tons of coal and 50,000 tons of miscellaneous cargo.

Engineering features.

5.12. Two rivers, the Gadilam and the Paravanar meet at Cuddalore and debouch into the sea. The Gadilam has its own bar also but normally its waters join those of the river Paravanar through the Uppanar backwater and both discharge as a combined river into the sea while the

Gadilam bar remains dry. When there are very heavy rains the Gadilam bar either opens itself or is artificially cut to prevent flooding of the adjoining areas. On these occasions Gadilam flows into the sea through both its own bar and that of Paravanar *via* the Uppanar backwater on which the port is located. The tidal influx of the Paravanar is much greater (about four times) than that of the Uppanar and the Gadilam but during short periods of very heavy rains the rain water discharge of the Gadilam exceeds that of the Paravanar and the balance gets altered.

5.13. The Uppanar backwater flows roughly from North-South and joins Paravanar which flows more or less from South-West to North-East. During South-West monsoon the sea currents at Cuddalore like other places on East Coast are South to North. During this period both the rivers Gadilam and Paravanar have only tidal flow as there is no rain in their catchments during this period with the result that both the influence of sea and the predominating river Paravanar make the flow move north-wards. This results in the bar moving north-wards every year. In the north-east monsoon the forces are reversed for a short period but in the balance south-north forces prevail. It has been found in the past that left to itself the bar moves north-wards at the rate of about 200 ft. per year. At what point this movement would end is not known, as every time the bar moves to near the Lighthouse a cut is given in the spit opposite the junction of Uppanar and Paravanar and the channel going north is blocked as otherwise navigation for lighters becomes long and difficult. This is done roughly about every ten years.

5.14. The littoral drift at Cuddalore is from south to north in the south-west monsoon and from north to south in the north-east monsoon. On balance the south-north drift predominates and it is estimated from observations at Madras and Nagapattinam that the balance of littoral drift from south to north is expected to be of the order of 0.5 million tons per year at Cuddalore.

5.15. With the existing tidal prism of Paravanar and Gadilam and the other forces operating at the site, as described above the depth of water over the Cuddalore bar goes down to about 2′-0″ at L.W.O.S.T. at certain times of the year. The range of tide at springs is 2′-0″ and that at neaps 1′-0″. With these depths only shallow draft lighters can be used at the port and that also at high water. If a traffic of 6·5 lakh tons a year is to be handled it is essential to deepen and stabilise the bar to enable 6 to 7 ft. draft tugs to cross the bar at all stages of the tide.

5.16. Cuddalore Port experiences cyclonic storms of the Bay of Bengal. Several intensive cyclones have passed over Cuddalore in the past. Any structures which have to be built in the sea at Cuddalore will therefore have to be adequately designed to withstand the fury of the cyclonic storms.

Model experiments.

5.17. Hydraulic model experiments were carried out at the Poona Research Station at the instance of the State Government to ascertain the feasibility of training the two rivers and stabilising their common mouth in one position. These experiments indicate that it will be possible to maintain a channel having a depth of 9 ft. below L.W.O.S.T. by training the combined estuary of the two rivers at a suitable position and constructing two inclined breakwaters at the mouth 1300 ft. long in the south

and 800 ft. long in the north. A sand trap on the south side of the mouth will also have to be made to trap the littoral sand which otherwise will envelop the southern breakwater and choke up the sea approaches of the port. This sand may initially be dredged from the sand trap periodically during the dredging season and fed to the northside of the mouth to maintain the material energy balance and thus prevent coastal erosion. Periodical dredging will also be required in certain locations inside the rivers. Drawing No. IPDC/5 shows the proposed entrance works for Cuddalore Port.

5.18. The scheme evolved by the Poona Research Station is, according to the experiments, capable of being developed for depths of 17 ft. below L.W.O.S.T. at the entrance and in the navigational channel to enable small coasters to visit the port. For this purpose breakwaters on the southern and northern sides of the mouth may have to be increased to 1900 ft. and 1700 ft. respectively. It has been recommended by the Research Station that before this extension is actually carried out, only the sand trap may be extended up to the 17 ft. contour in the first instance and tried without breakwaters. The effect of dredging in the sand trap without the extension of the breakwaters may then be studied and if successful, the extension of the breakwaters need not be taken up. With a 17′ channel however silting is likely to be very much more severe and this will necessitate more intensive maintenance dredging.

Port development.

5.19. Taking into consideration the future traffic potential of the port, the Committee recommends the further development of Cuddalore Port immediately into a 9 ft. harbour capable of handling roughtly 6·5 lakh tons of traffic per annum. The various items of works required for this development which may be given first priority are: the training of the two rivers and the construction of two inclined breakwaters at the mouth as recommended by the Poona Research Station. The estimated cost of these works is Rs. 50 lakhs as per details given in Appendix X. Other works required to complete the development which may be given a second priority are: the development of Spoil Island for the handling of iron ore; the provision of an inspection-*cum*-survey launch, a 50-ton water barge with equipment for supplying water to ships, a 2-ton mobile crane for handling miscellaneous cargo, a grab dredger with mud-punts for dredging alongside the wharves and a 300 H.P. tug for towing lighters; the construction of essential quarters for port staff; the reconstruction of certain stretches of the existing wharves where they are damaged: the improvements to the aids for night navigation for lighters; and various miscellaneous works. The total cost of these development works is estimated to be Rs. 28·40 lakhs as per details given in the Appendix X. For the first few years after completion of this stage of the scheme, the periodical dredging of the sand trap will have to be carried out by one of the sea-going cutter suction dredgers proposed to be purchased by the Government of India in the Ministry of Transport and Communications (Transport Department) for the minor port dredger pool. If subsequent experience of dredging with this dredger shows that a part-time dredger is not adequate the port will have to acquire a suitable seaworthy dredger of its own. At this stage, a suitable slipway will have to be built at the port for the periodical overhauling of this dredger. The cost for the dredger and the slipway is estimated to be roughly Rs. 23 lakhs and may be given a third priority as per details given in Appendix X.

Economics of port development.

5.20. The economics of port development at Cuddalore for handling 5,00,000 tons iron ore, 1,00,000 tons of coal and 50,000 tons of general cargo were studied by the Committee. Based on the present wharfage charges, the nett annual revenue was found to be Rs. 53,000 or 0·7 per cent. of the total capital to be invested after allowing for depreciation of assets and interest on capital. The details on which this is based is given in Appendix XIII. By slight enhancement of the wharfage charges, the annual revenue may be further increased if the need for the same is felt in the future.

The Port of Nagapattinam

General.

5.21. The Port of Nagapattinam is located at the mouth of the river Kaduvayar in the Bay of Bengal roughtly 165 miles and 70 miles south of Madras and Cuddalore respectively. Nagapattinam is a prominent port of the Tanjore District and is classified as an intermediate port. Prior to the war, the port was of considerable importance. Steamers on the Bombay-Rangoon, Karachi-Calcutta and Madras-Straits lines called regularly at this port. The Madras-strait Passenger Steamer Service, however, is the only regular service which is still being maintained. The trade of this port also has dwindled to roughly 20,000 tons per annum. The port facilities which are listed in Appendix VII are located near the mouth of the Kaduvayar on its left bank. Drawing No. IPDC/6 shows the layout of the existing facilities at Nagapattinam.

Traffic pattern.

5.22. Nagapattinam Port handles at present a cargo traffic of 20,000 tons and a passenger traffic of 22,000 persons per annum. The volume of annual traffic handled at the port of Nagapattinam from 1950-51 to 1959-60 and the number and the nett registered tonnage of steamers and sailing craft which visited the port during this are given in Appendices VIII and IX of this report.

5.23. The existing traffic at Nagapattinam consists mainly of the export of 16,000 tons of sundries, such as jaggery, onions, beedis and tobacco to ports in Malaya and the import of roughly 3,000 tons of cargo mainly betel nuts from Malayan ports. The passenger traffic consists of roughly 12,000 passengers embarking and 10,000 passengers disembarking per annum to and from the ports of Malaya.

Future traffic.

5.24. The prospects of large additional traffic at Nagapattinam is not bright. For iron ore exports from the Bellary-Hospet region, the distances from the mines are longer by 85 miles than to Cuddalore or Pondicherry. With this limitations, Nagapattinam will not be suitable for handling ore. The only additional traffic that may reasonably be expected at Nagapattinam is some extra imports of billets of the order of 10,000 tons and some 10,000 tons of coal required for the Nagapattinam Rolling Mills. It may also be possible to export some cement of the order of, say, 10,000 tons per annum through Nagapattinam Port from the cement factories located at Dalmiapuram and Tirunelveli. On the whole, therefore, an additional

traffic of 30,000 tons over and above the existing traffic of 20,000 tons, thus making 50,000 tons per annum may reasonably be expected at Nagapattinam in the next 10 years.

5.25. The importance of Nagapattinam Port is, however, from the point of view of an established passenger traffic with Malayan ports. This traffic is likely to continue. It is in this context that the development works at Nagapattinam should be viewed. The present bar at Nagapattinam is very shallow, narrow and dangerous for the passage of lighters carrying passengers. Accidents to these lighters have been reported in the past resulting in the loss of human life.

Engineering features.

5.26. The harbour at Nagapattinam is formed by the Kaduvayar which flows parallel to the coast in a northerly direction for about half a mile and debouches into the sea. This stretch is protected from the sea by a narrow sand spit. There is a bar at the mouth of Kaduvayar having a depth of about 2 to 3 ft. at low water. The range of tides during springs is of the order of 2 ft. and that at neaps 1 ft. The sea breaks over the bar in almost all weathers. Though lighters of the type playing at Nagapattinam can pass the bar at half tide, the passage is dangerous.

5.27. Nagapattinam has a large area of backwaters. Prior to 1840 the Vellayar river joined the Kaduvayar some 2 miles above the port. Due to the occurrence of floods, an opening was made at Velanganni about 7 miles from the port to divert the flow of the Vellayar to the sea. This has resulted in deterioration of the bar at the mouth of the Kaduvayar as the head-water supply has been reduced. The Velanganni regulators were therefore constructed to divert part of the water to the Kaduvayar through the Vedaranyam canal though not with any appreciable success in improving the bar.

5.28. The feature of the sea coast at Nagapattinam in common with other ports of this coast is the intense littoral sand drift. In south-west monsoon both the sea current and directions of waves cause littoral drift from south to north while in the north-east monsoon the conditions are reversed. Due to the prepronderance of the south-west monsoon over the north-east monsoon, the nett annual effect is a movement of sand to the north along the coast. The rough estimate of this quantity in shallow waters is in the region of half a million tons per annum from the observations carried out at Nagapattinam Port by the State Government in the twenties with the help of temporary groynes constructed into the sea.

5.29. Nagapattinam lies within the cyclonic area. Cyclones have been recorded at Nagapattinam during several years in the past. The cyclones during the month of November seem to affect Nagapattinam most. During the cyclones on the 30th November 1952, a gale force of 9 in the Beaufort scale was recorded at the port. A storm wave of great force which was estimated to be about 4 ft. in height above the ground level swept through the town which resulted in great damage to the town and the port. During this cyclone, the sand spit separating the harbour from the sea was also breached. Any structure which will have to be built in the sea at Nagapattinam will therefore have to be adequately designed to withstand the fury of the cyclonic storms of the Bay of Bengal.

5.30. The mouth of the Kadiuvayar has been partially trained. There are two parallel groynes on either side of the mouth. The northern groyne is of the needle pile type which can be opened and closed when necessary. The southern groyne is of steel sheet piles and rubble mound. During the period of the south-west monsoon, the needle piles on the northern groynes are kept closed to prevent the channel taking a sharp turn to the north just after entry into the sea. With the experience of the breach of the sand spit of 1952, this spit has also been strengthened by the construction of a sea wall at the more vulnerable places.

Port development.

5.31. Taking into consideration the importance of Nagapattinam Port as a passenger port and the danger to life and craft involved in the passage of lighters over the bar, the Committee recommends that the works designed to improve the bar at Nagapattinam which is already an item included in the Second Five Year Plan, should be proceeded with and given first priority. This proposal involves the construction of a re-inforced concrete pier with removable needle piles from the shore to a distance of 800 ft. from the sea terminating at a point where the sea bed contour is 8·0. The alignment of this pier is shown in Drawing No. IPDC/6 attached to this report. A mobile sand pump will be mounted on the pier which will be able to excavate a channel of about 75 ft. in width and 8·00 in depth below L.W.O.S.T. running parallel to the pier. The channel will require to be dredged in south-west monsoon when the needle piles will be closed to prevent the channel from meandering northwards under the pier. The drift from the south will accumulate against them. In the north-east monsoon the needle piles will be removed and the channel is expected to remain naturally clear. As the dredging will be done in south-west monsoon the dredged spoil will be discharged on the north-side of the pier to be carried away by the prevailing littoral drift. The estimated cost of this project is Rs. 10 lakhs as per details given in Appendix X. In addition to this scheme certain other works will also be required to improve the port and enable it to handle the estimated traffic of 50,000 passengers and 50,000 tons per annum. The various items of works required for this purpose are: the reconstruction and improvements of the existing passenger sheds; the reconstruction of some 350 ft. of damaged and dilapidated lighterage wharf; the improvement to the present timber wharf, the joining up of gaps in the central and south wharves and the construction of a small transit shed near the timber wharf to enable this wharf to handle general cargo; the construction of essential quarters for port staff; the acquisition of a tug for towing passenger lighters to and from the ships in the anchorage; and the provision of a small slipway for carrying out repairs to port craft. The above works may be given a second priority. The total estimated cost of these works is roughly Rs. 12·15 lakhs as per details given in Appendix X. The Committee also considered it necessary that the intensity of the existing lighthouse should be improved. The cost of this works is roughly Rs. 1 lakh and may be given third priority. In addition a small cutter suction dredger for carrying out internal dredging estimated to cost Rs. 6 lakhs may also be given third priority.

5.32. The State Government is also considering the development of a fishing harbour at Nagapattinam. The improvement of the bar will considerably facilitate the implementation of this scheme. The site of

the proposed fishing harbour is one mile inland from the existing port on the Kaduvayar river.

The Port of Tuticorin

General.

5.33. Tuticorin, one of the most important intermediate ports in India, is located on the Gulf of Mannar roughly 100 miles from Cape Comorin. The port is an open road-stead, the anchorage being roughly 5 miles off shore to the east of Hare Island. Cargo is handled by lighters between ship and shore. The Bay formed by Hare Island, Devil's Point and the mainland gives ample protection to the lighters from monsoonic weather conditions. The port is open to traffic throughout the year. Appendix VII gives a list of the existing port facilities at Tuticorin.

History of Port Development

The Wolfe Barry scheme.

5.34. In 1919, the Government of Madras invited Messrs. Sir John Wolfe, Barry, Lyster and Partners, Consulting Engineers, U.K., to visit certain minor ports of the then Madras Presidency and make recommendations for their development. The Consulting Engineers were also instructed that the investigations at each port should be limited by the consideration that any scheme to be offered should be of such a scope as was justified by the prospects of future trade and was likely in the course of time to pay for itself. Tuticorin was one of the ports investigated by the Consulting Engineers. From a study of the trade figures of the more important ports, the Consulting Engineers noted that there had been an increase of trade at Tuticorin during the 10 years ending in 1913-14 amounting to 134 per cent. while in the year 1913-14 the trade passing through this port represented 17 per cent of the total trade of the Madras Presidency. Looking generally at the hinterland, railway connections and the other features combined with trade prospects, it appeared to the Consulting Engineers that there was scope for a deep water port at Tuticorin where ships could lie in shelter alongside the wharf and could load direct into or from railway trucks. The Consulting Engineers, therefore, prepared a Plan and an estimate together with a report for developing Tuticorin. The new port was to be located on the south end of Hare Island. The access to the proposed dock with deep-water quays was to be gained by an entrance channel dredged through Hare Island having a width of 600 ft. at the 5 fathom contour varying to 400 ft. at the entrance to the dock and with a depth of 30 ft. below L.W.O.S.T. The shore end of the approach channel was to be protected by 2 stone groynes which would also have the function of degrading the waves entering the approach channel. The dock was so laid out that it could be built in successive stages. The first stage provided for the construction of an arm 2,000 ft. long leading from a turning basin 1,000 ft. x 1,000 ft. The berths and turning basin would have a least depth of 30 ft. below L.W.O.S.T. In order to ensure smooth water in the dock and to prevent silting up due to any sand or mud which might be brought in by the tidal currents, an inner protecting groynes some 10,000 ft. long extending from the mainland to Hare Island was also to be provided. For carrying out the dredging operations, the Consulting Engineers recommended a bucket ladder dredger having a capacity of 500 cubic yards per hour digging from a depth of 40 ft. below water level, together with

attendant hopper barges. Due to the lack of boring data at that time the Consulting Engineers assumed cutting through coral as the hardest stratum to be dredged and the dredger proposed was, therefore, only suitable for this purpose. The cost of the scheme as estimated by the Consulting Engineers was Rs. 44,00,000. Drawing No. IPDC/7 attached to this report shows the proposals put forward by Messrs. Wolfe, Barry, Lyster and Partners.

The Bristow Scheme.

5.35. In 1920 the Government of Madras appointed Mr. Rober Bristow (now Sir Robert Bristow), as Harbour Engineer to that Government for the purpose of developing ports in the Madras Presidency. He was specifically instructed to prepare detailed plans and estimates for the scheme of harbour development at Tuticorin suggested by Messrs Sir John Wolfe, Barry, Lyster and Partners. Mr. Bristow thereupon undertook to put down several borings, the results of which indicated that hard coral and rock existed in varying thickness at various depths over the whole of the area through which the approach channel and basin were to be excavated. In view of the differing dredging conditions, the cost of dredging alone was estimated by him to be Rs. 87,00,000. As any scheme of this magnitude was considered to be beyond the financial capacity of the port, Mr. Bristow in 1922 formulated a new proposal (called the Bristow scheme in this report), which in its first stage was estimated to cost only Rs. 40,00,000. The main features of the Bristow Scheme are shown in Drawing No. IPDC/7 attached to this report. The scheme included the construction of a narrow land locked canal through the reef and island with sidings for vessels to lie in and with a small but sufficient turning basin as the western extremity. The approach channel having a width of 350 ft. and depth of 30 ft. below L.W.O.S.T. was to extend from the five fathom contour to the edge of the reef about a mile in length. In continuation of the approach channel a canal about one mile long with a bottom width of 90 ft. and a least depth of 30 ft. below L.W.O.S.T. would be cut across the reef terminating in two sidings for vessels each 700 ft. long, one on each side of the canal at the western end. A turning basin 1000 ft. square beyond the western extremity of the canal with banks on the north and south sides at which two more vessels would be able to lie was also to be built. The materials from the excavations would be used for reclamation on both sides of the canal. This plan for development of Tuticrin was approved by the Madras Government at an estimated cost of Rs. 39·96 lakhs. The bucket ladder dredger "St. David" was then purchased from the British Admiralty which arrived in India in November 1923 and was put to work in the approach channel in April 1924. It had been expected that this dredger would be able to dredge the whole of the approach channel. The sub-marine rock encountered was found not to be sufficiently irregular and fissured to allow being dredged by a bucket dredger and so after clearing the top layer of sand and spending considerable time in trying to make a face in the hard rock, she was stopped from further work in February 1925. For the rest of the work, a combined dipper dredger and rock breaker was ordered from Messrs. Lobnitz and Co. This vessel, the "St. George" was taken over at Tuticorin after trials on the 18th of June 1925 and was set to work in the turning basin.

5.36. In June 1926, the Harbour Engineer submitted a report on the results of the first year's dredging at Tuticorin which he regarded as the

experimental stage of the work. In this report he brought to the notice of the Madras Government the existence of a hard layer of rock roughly between 12 ft. and 16 ft. below low water and another hard layer of yellow sand stone conglomerate between 24 ft. and 27 ft. below low water and explained that the dredging of this lower layer by the "St. George" was not an economical proposition. He accordingly proposed the purchase of another dredger of the type of "St. George", but with double the horse power to dredge the lower layer and to make suitable faces in the rock in the outer channel for the "St. David" to work on. He also suggested the purchase of two hopper barges of 250 tons capacity and two steam navvies to facilitate the removal of the dredged material. The cost of these further proposals amounted to Rs. 14·85 lakhs raising the aggregate cost of the scheme to about Rs. 57 lakhs including the cost of a dry dock for the dredgers and of the steam navvies. The design of the dredger was evolved after several consultations between Mr. Bristow and the representatives of Lobnitz and Co. The dredger was to be of the dipper type with an 8 cubic yard bucket and capable of dredging at the rate of 480 cubic yards of free getting material per hour. The vessel would be provided with a second dipper bucket of 5 cubic yards capacity for hard materials. Messrs. Lobnitz and Co. were at that time of the opinion that one 10-ton rock breaker will deal effectively and economically with any rock likely to be encountered at Tuticorin. The Government of Madras after discussions with the Port Trust decided that the scheme should be referred to an independent Committee of Harbour Engineers for thorough examination and report on the proposals suggested by Mr. Robert Bristow.

The Palmer Committee Scheme.

5.37. The expert committee appointed by the Madras Government to examine the project of Mr. Robert Bristow consisted of the following members:

(1) F. Palmer, Esq., C.I.E. (Chairman).

(2) Col. C. G. Ducane (of Messrs. Sir J. Wilfe Barry and Partners).

(3) H. H. G. Mitchell, Esq., O.B.E. (of M/s. Goods Fitzmaurice, Wilson and Mitchell).

The terms of reference of the Committee and their findings are set out below:—

(1) Are the dredgers provided suitable for the work having regard to:

(a) the results obtained up to date;

(b) the borings over the site generally?

Answer: For the dredging down to 24 ft. below low water, the present dredgers appear to be suitable, but for the completed scheme—to give 30 ft. clear navigation—they are unsuitable.

(2) Is the reclamation being made in the best possible manner?

Answer: Yes, for the scheme now in progress—a turning basin only.

(3) What is the best type of dredger for dealing with the very hard stratum between—24 and—27 L.W.O.S.T. in the turning basin?

Answer: A dipper dredger of the type of the "St. George", but fitted with rock breaker and larger and more powerful throughout. It is also possible that blasting may have to be done in some places.

(4) Is the estimate sufficient having regard to the results obtained to date and those likely to be obtained by the provision of the plant recommended?

Answer: In regard to the dredging which is the crux of the whole estimate the Committee was inclined to think the estimate low, but, on inspection of the dredging cost schedules covering a period of 23 weeks ending on 6th August last, it was found that the actual costs indicated a probability of completion within the estimated figures. The decreasing cost from time to time during this period confirmed this impression.

(5) If the work were given out on contract could a contractor be bound rigidly to a fixed sum under the specification and the general conditions, usual for a harbour work of this description, *i.e.* is it possible to preclude the payment of extras for unforeseen causes in these harbour works?

Answer: In the usual form of contract, a contractor would not be bound rigidly to a fixed sum. He would be bound only to the extent of the work, shown or described, at the prices tendered or agreed, and it is not possible to preclude payment for extras either ordered or arising from unforeseen causes. To enter into a rigid lump-sum contract in works of this nature would be embarking upon little less than wild speculation.

(6) Considering the fact that the approach channel is to be dredged partly in hard coral, of which its sides will be composed, do the dimensions provided in the estimates afford a safe approach for the type of vessel expected to make use of the port and do the approach channel and the turning basin together afford ample manoeuvring space for such vessels?

Answer: For a single line of traffic, it is considered that a bottom width of 350 ft. with clear low-water depth of 30 ft. would suffice for vessels of the type trading at Tuticorin. In view of the fact that widening can be carried out in the future (if then required) without sacrificing expenditure previously incurred, it is recommended that this width be not altered for the present. The area of the turning basin seems ample for the purpose.

(7) Considering the natural facilities of the locality and all other circumstances of the case, is the site selected for the work the most suitable for those suggested for Messrs. Sir John Barry, Lyster and Partners in 1920 and by Mr. Bristow in 1922?

Answer: It is understood that the selection of the site adopted for the turning basin was the result of comparisons of estimated cost at three sites, on and inside the island, and that the cheapest site is that now being worked upon. In these circumstances, the Committee is unable to name, or point out, any more suitable place in this vicinity.

(8) The views of the Committee on the commercial aspect of the question?

Answer: The Committee did not consider that the partial scheme (as the Committee called the Bristow scheme) then under construction was in itself of sufficient benefit to the traders to justify the expenditure of Rs. 60 lakhs. The partial scheme would be justifiable only on the amount of difficulty and delay experience in loading and unloading vessels in the open roadstead. The Committee, however, understood that the partial scheme had always been intended by Government to form part of a complete scheme for dock with quays and cargo handling appliances estimated to cost Rs. 120 lakhs. The Committee considered that this sum would place almost an insufferable burden upon the trade at Tuticorin.

5.38. The Palmer Committee also suggested a new scheme which they considered to be in the best interests of the trade at Tuticorin. This scheme suggested by the Committee is shown in Drawing No. IPDC/7 attached to this report. The main features of the scheme were the continuation of the approach channel included in the Bristow Scheme across Hare Island towards the town of Tuticorin and to construct at the inner end the first portion of a plan of dock development which would permit further extensions as and when required. Between the wharf walls and the present shore lines of area about 200 acres of foreshore would be reclaimed for siting dock facilities such as the railway terminals, transit shed, warehouse, etc. and for business premises and other extensions of the town. The Committee considered that this reclamation by reason of its proximity to the existing town would be of much greater immediate value to Tuticorin than the area provided in the Bristow and Wolfe Barry Schemes. Such a scheme as was suggested by the Palmer Committee had been considered on previous occasions, but had to be abandoned in view of high capital expenditure involved. The accommodation for steamers suggested by the Palmer Committee included 2,000 ft. of quay as against 2,500 ft. in the completed Bristow Scheme, because it was considered that the provision of 5 berths as initial development would probably suffice for the requirements at that time. The Palmer Committee estimated the cost on their project to be Rs. 140 lakhs after crediting surplus plant etc.

5.39. The Palmer Committee further suggested that the Tuticorin Port Trust should only bear such portions of the capital expenditure as may be within the means of the Port and that any balance of expenditure as may be in excess of the paying capacity of the trade should be paid by Government. The Palmer Committee specially stated that the Government would be justified in taking such a step because it was felt that increased prosperity in that portion of the Province would materialise by the construction of a harbour and thus indirectly compensate the

Government in regard to the grant or loan which might have to be provided.

5.40. The Palmer Committee felt that the traders would welcome this new proposal put forward by the Committee because it would leave their present establishments, warehouses and other trading requirements undisturbed, whereas a change to Hare Island would involve not only the extra expenditure in the transport of goods to and from between Hare Island and the town but also considerable expenditure in constructing additional warehouses and transit sheds at the Hare Island site and the depreciation of the value of their properties in the Tuticorin town.

5.41. In view of the recommendations of the Palmer Committee, the Government of Madras in consultation with the Port Trust, decided to keep in abeyance the partial Bristow Scheme and in the meantime to prepare detailed estimates for both the full Bristow Scheme and the Palmer Committee Scheme. Mr. Bristow who by this time became Harbour Engineer-in-Chief to the Government of Madras, prepared estimates for the two schemes which came to Rs. 120 lakhs for the Bristow Scheme and Rs. 160 lakhs for the Palmer Committee Scheme.

5.42. In 1929, the Tuticorin Port Trust decided that they did not want the partial Bristow Scheme or any modification thereof and that they would be willing to proceed with the Palmer Committee Scheme provided financial assistance was forthcoming. The Government of Madras was not in favour of granting the required assistance. The trust thereupon decided to abandon the whole of the works so far constructed at a cost of nearly Rs. 30 lakhs and the whole matter was shelved indefinitely.

The Chatterjee scheme.

5.43. The proposal for development of Tuticorin was again taken up by the Madras Government in 1954 and the Government of India was approached in this matter. On the advice of the Government of India the State Government in August 1954 appointed Shri B. N Chatterjee, former Chief Engineer of the Calcutta Port Commissioners to carry out a preliminary investigation into the feasibility of developing Tuticorin into a 20 ft. harbour. The general arrangement of a 20 ft. harbour, as suggested by Shri Chatterjee, is shown in Drawing No. IPDC/7 attached to this report. The scheme provides for a dock and anchorage both located near the town on the north side of the existing port and an approach channel connecting the harbour with the deep sea. The dock was to have a general berths, one coal berth, one salt berth, two lighterage berths and one slipway. An oil installation was proposed to be provided near Devil's Pass. Two oil berths were to be sited in a recess in the approach channel near Hare Island. The material from the excavation as well as from the maintenance dredging in the future was to be used for a programme of reclamation work. The approach channel width was kept at 200 ft. and the depth 27½ ft. below L.W.O.S.T. for a 20 ft. harbour to allow for swell, squating and clearance. The approach channel was sited away from Hare Island on the north-side with a view to avoid as much as possible the northward sand drift along Hare Island. Shri Chatterjee suggested that Tuticorin harbour development should be taken up in stages. In the first stage

the approach channel and three berths should be provided. Transit sheds, warehouses, cranes, roads, railways and marshalling yards would have to be provided at subsequent stages according to traffic demands. The time required to complete the first stage was given as 6 years, three years for the approach channel and three years for the berths. The total cost of the first stage of development was estimated to be Rs. 4.5 crores. Shri Chatterjee also recommended a dipper dredger with rock breaking equipment as the most suitable machine for the work at Tuticorin.

The Sethusamudrum Committee Scheme.

5.44. The Government of India in November 1955 constituted the Sethusamudrum Committee to report amongst other things on the feasibility of connecting the Palk Bay with the Gulf of Manner, this proposal being known as the Sethusamudrum Scheme. The precise terms of reference to this Committee and the answers given by them are given below:

"(a) What is the extent to which shipping in general is likely to benefit by and in practice to take advantage of the shortened sea route *via* the Sethusamudrum Passage?	(a) If the Sethusamudrum Project is designed and executed on the lines recommended by us and if the charges levied on ships were also fixed in the manner recommended by us, we estimate that the number of ships using Sethusamudrum Navigation Route will be 1,613 per annum. The aggregate total tonnage of shipping using the Canal each year will be approximately 107 lakhs of G.R.T. or 64 lakhs of N.R.T. and the benefit derived by such shipping will be as follows: (i) A saving in distance up to maximum of 362 miles; and consequently a saving in the time of voyage of a day or a day and half; and (ii) a more sheltered passage throughout the year.
(b) Would the advantages likely to be secured be commensurate with the expenditure involved?	(b) We are satisfied that the advantages likely to be secured will be commensurate with the expenditure involved.
(c) What are the traffic prospects of the Tuticorin Port during the next decade?	(c) (i) Provided the Sethusamudrum Navigation Route is opened and the Tuticorin Port is improved in the manner recommended by us, was estimate the total tonnage of cargo imported and exported in Tuticorin Port to be of the order of 8 lakhs of tons and is likely progressively to increase.

(ii) In the event of the Sethusamudrum Navigation Route not being provided, any significant increase is unlikely so long as the Port is not developed to take 30 ft. draught. If the Port is developed to take ships upto 30 ft. draught, in the absence of Sethusamudrum Navigation Route, it is probable that there would be a modest increase in the trade, say, of the order of one or two lakhs of tons per year, and there would also be a corresponding increase in the number and size of ships calling at the port provided bunkering and watering facilities are made available.

(d) In the light of the traffic assessment, should the Tuticorin Development Project be proceed with?

(d) Yes.

(i) immediately by itself and independently of the Sethusamudrum Project.

(ii) Simultaneously with the Sethusamudrum Project:

or

(iii) at a later stage, and if so, when?

(i), (ii) and (iii) The two projects are closely interrelated. The success of one depends on the other. In our opinion they should be executed as parts of one and the same project, and completed during the Second Five Year Plan period."

For the development of Tuticorin harbour, the Committee selected a site adjoining Seltive Reef further to the north of the site selected by Shri Chatterjee. The lay out of the approach channel and dock recommended by the Sethusamudrum Committee is shown in Drawing No. IPDC/7 attached to this report. The approach channel would be 5,400 yards long and 100 yards wide and 36 ft. deep. An anchorage was to be built at the western end of the approach channel. A pier and causeway carrying a railway and road were to connect the shore with the port. The Sethusamudrum Committee estimated their scheme to cost Rs. 1·62 crores.

Scheme suggested by Shri I. G. Chacko.

5.15. After study of the earlier alternatives Shri Chacko suggested an alternative site in the shelter of Church Island with two alternative approaches. These are shown in Drawing No. IPDG/7.

Scheme suggested by Shri H. P. Mathrani.

5.46. After inspecting the site Shri Mathrani suggested two additional alternative alignments for study. These are shown in Drawing No. IPDC/7.

Traffic Pattern.

5.47. Tuticorin now handles a traffic of the order of 7 lakh tons per annum. Salt is the most important commodity passing through Tuticorin. In 1956-57, nearly 3 lakhs tons of salt were produced in the vicinity of Tuticorin out of which one lakh tons were shipped to Calcutta for internal consumption and another one lakh tons for exports to Indonesia. In 1957-58, the export of salt increased to 2.59 lakh tons. In 1958-59, the salt traffic stood at 2·51 lakh tons and in 1959-60 salt traffic increased to 2·73 lakh tons. The second important commodity in the traffic at Tuticorin is coal. The coal required by the Southern Railway as well as by the cement factories in the vicinity of Tuticorin is imported through Tuticorin Port from Calcutta. In 1957-58, 1.75 lakh tons were imported through Tuticorin. In 1958-59, the coal imports were 2.38 lakh tons and in 1959-60 2.73 lakh tons. The Indo-Ceylon trade is another important trade at Tuticorin. This amounted to 55,000 tons in 1957-58, 1,33,005 tons in 1958-59 and 1,68,720 tons in 1959-60. There are also two cement factories in the vicinity of Tuticorin. These are located at Talaiyuthu and at Tulukkapatti, their distances to Tuticorin being 35 and 65 miles respectively. The cement exports *via* Tuticorin amounted to 25,360 tons in 1957-58, 39,153 tons in 1958-59 and 63,731 tons in 1959-60. Other items of traffic during 1958-59 included the imports of 55,341 tons of fertilizers and 92,698 tons of general cargo both imports and exports. Out of the total trade of 7,86,621 tons in 1958-59, the percentage of traffic carried by sailing craft amounted to 23.14. A statement showing the exports and imports per annum from the year 1950-51 to 1959-60 showing steamers and sailing craft traffic separately and the number and net registered tonnage of steamers and saling craft which visited the port is given in Appendices VIII and IX attached to this report.

Traffic Survey by the National Council of Applied Economic Research.

5.48. A traffic survey to assess future traffic potential of Tuticorin was carried out by the National Council of Applied Economic Research at the request of the Tuticorin Port Trust. This survey reveals the following pattern and volume of traffic by 1964-65:—

Estimate of Future Traffic at Tuticorin Port

IMPORTS

Commodity	Present pattern and volume of traffic (1957-58)	Future pattern and volume of traffic (1964-65)	Remarks
Coal a/c Railways . .	1,75,000	2,25,000	Consumption of coal on Southern Railways (metre gauge section) is likely to increase by 5% every year.

1	2	3	4
a/c Industries . .	25,000	1,75,000	In 1961, requirements of coal for cement factories will amount to 2,25,000 tons. According to conditions laid down in the Industrial licence bulk of this coal will have to be moved by the sea-*cum*-rail route.
Foodgrains and fertilizers .	60,000	60,000	No change.
Raw cotton . . .	10,000	30,000	Increase due to installation of fumigation facilities at Tuticorin.
Gunnies	1,000	10,000	For cement industry and for general use.
Blacksheets . . .	nil	5,000	For chemical works and other use.
Import from Ceylon .	5,000	10,000	Cargo now passing through other Indian Ports may be landed at Tuticorin.
Imports from Europe, America & South East Asia.	5,000	50,000	Cargo now passing through other Indian Ports may be landed at Tuticorin. Larger discharge of transhipment cargo is anticipated.
Other imports including coastal traffic.	4,000	20,000	Due to increase movement of commoditics by coastal vessels and lighters.
TOTAL .	2,85,000	5,85,000	

EXPORTS

Commodity	Present pattern and volume of traffic (1957-58)	Future pattern and volume of traffic (1964-65)	Remarks.
Salt	2,59,000	2,00,000	Exports to foreign markets may decrease.
Cement	25,000	1,75,000	A modest estimate. Cement available for shipment has been estimated by the cement factories at 500,000 tons.
Exports to Ceylon .	50,000	80,000	Demand in Cylone is likely to increase.
Exports to Europe America and South East Asia.	60,000	90,000	Due to export promotion drive.

1	2	3	4
Caustic soda	Nil	30,000	Product of the recently established Chemical Works
Other exports including coastal traffic	1,000	40,000	Due to large scale export of cotton yarn, textiles, tapioca flour, etc.
Total . .	4,15,000	6,15,000	

	Summary *Present*		*Future*	
Imports	2,85,000	tons	5,85,000	tons
Exports	*4,15,000*	tons	*6,15,000*	tons
Total . .	*7,00,000*	tons	*12,00,000*	tons

5.49. The Council also visualised a long-term traffic at Tuticorin of the order of 2 million tons. It saw the likelihood of discharge of petroleum and petroleum products at the port after 10 or 12 years when the consumption of this commodity all-over India will increase considerably. The consumption of petrol, diesel oil, kerosene oil and furnace oil in the hinterland of Tuticorin at present is of the order of 1.5 lakh tons per year. The consumption is estimated by the Council to increase at the rate of 10 per cent per annum to reach a figure of 2.83 lakh tons by 1964. This quantity, it is stated, is exclusive of bunkering oil which is estimated by the Council to be one lakh tons per annum if a deep water port is located at Tuticorin. The present method of moving oil is through Cochin Port from where it is despatched by boats to Quilon on the backwaters and railed from there to the hinterland of Tuticorin through Shenkottah. The Council was of the opinion that a saving of Rs. 35/- per ton could be achieved by providing oil discharge facilities at Tuticorin. The Council also felt that consequent on the proposed increase in iron and steel production envisaged in the 2nd and the 3rd Five Year Plans, a larger proportion of steel will move to the south for which Tuticorin will be a suitable port for distribution in its hinterland. The Council has also drawn attention to the fact that there are reserves of ilmenite sand around Sattankulam within 30 miles of Tuticorin which can be conveniently exported through Tuticorin. Sizeable additional traffic is also visualised if transhipment facilities are provided in the proposed deep-sea port at Tuticorin. The hinterland at Tuticorin Port as visualised by the Council is shown as an inset to Drawing No. IPDC/7 attached to this report.

Future Traffic.

5.50. From the evidence collected by the Committee, the Committee felt that the coal traffic was not likely to increase as railways were increasing their own capacity to carry coal. Also the representatives of oil interests informed the Committee that for a long time to come it will not be economical for them to have new installations at Tuticorin and that as far as they could see they could continue to serve the hinterland of Tuticorin

from Cochin. Having regard to the possibilities of future developments in this area the Committee considers it reasonable to expect that the traffic at Tuticorin at the end of next five years may be of the order of 1 million tons a year.

Justification for a deep sea port at Tuticorin.

5.51. In view of the estimated traffic of one million tons a year by 1964-65 and the reasons mentioned below, the Committee considers that a deep-sea harbour with alongside facilities is necessary at Tuticorin:—

(a) The maximum cargo handling capacity of the port with its present port facilities is of the order of only about 8 lakh tons per annum. The port will have to work under great difficulties if required to handle a cargo above this figure. The Committtee investigated the possibility of further developing Tuticorin as a lighterage port for catering for the future expected traffic. In view of the lack of adequate space at Tuticorin, this scheme will involve the reclamation of large areas from the sea in front of the town and would cost roughly 3.4 crores of rupees. A scheme of this nature is also not capable of being integrated with future development as a deep harbour as the most suitable site for the latter is far away from the present lighterage ports so that the additional facilities to be provided for a lighterage port costing Rs. 3.4 crores will be wasted. In the Committee's view, it is better to develop a deep-sea harbour with alongside berths costing Rs. 10.27 crores as here-in-after explained now than to spend Rs. 3.4 crores on a lighterage port to cater only for the trade of the immediate future and to have them wasted later on.

(b) With the development of a port with alongside facilities, Tuticorin Port will be able to function as a transhipment port on the lines of Colombo. At present Colombo is used as a transhipment port even by Indian steamers.

(c) By developing a deep-sea harbour at Tuticorin, all the ships calling at Tuticorin both Indian and foreign will bunker at this place instead of at Colombo thus saving and earning foreign exchange.

(d) The sailing distance between Madras and Cochin, the two southern most major ports of India, is 950 miles without any deep-sea harbour other than Colombo. Tuticorin will be 350 and 650 miles respectively distant from Cochin and Madras for steamers plying in this stretch around Ceylon.

(e) The Tuticorin Port Trust possess about 2000 to 3000 acres of land suitable for development of industries and expansion of Tuticorin town. This will bring to the Port a considerable income in the future.

(f) The construction of a major harbour at Tuticorin will also have certain indirect benefits. These are:

(i) increased prosperity in this region;

(ii) rehabilitation of displaced persons of Tamil origin from Ceylon; and

(iii) impetus to the growth of the industries in the vicinity.

(g) The port has now entirely to rely on lighters owned by private parties for carrying on the trade of the port. Lighter owners, however, find it profitable to operate the lighters in fair weather as sailing craft on the coastal run. This creates shortage of lighters at Tuticorin in fair weather. The port, therefore, finds it difficult to maintain the shipping rate during the fair-whether season. With the increased traffic the difficulty will become much greater.

Engineering features.

5.52. The marine, engineering and physical features of the Tuticorin Port are described below:—

(a) The coastal region at Tuticorin is flat for several miles inland. The string of islands off shore including Hare Island are low lying, sandy and surrounded by coral reefs. The bay formed by the main land, the islands and Devil's Point are well sheltered for lighterage work. A certain amount of protection is also afforded to the bay from north-east seas by Van Thivu or Church Island. Between the western entrance point of the Viapar river and Tuticorin about 30 miles south south-westward, the coast line forms a bight which is occupied by a flat of less than 3 fathoms over it. This extends to a distance of about 4½ miles off shore and on which are located some Islets. Between the promontory close westward of Pannaj aiditeva known as Devil's Point and Mandapam Point about 24 miles South south-westward, the coast is generally speaking, low and sandy and fringed with coconut trees.

(b) The sea bed From the Admiralty Chart of 1879 and the Chart prepared by the Indian Navy in 1955, the sea bed in the Bay at Tuticorin is seen to consist mostly of mud and sometimes of sand and mud. Off Hare Island, the bed is mostly of coarse sand, shells and stones in places. Off Church Island, the sea bed as shown in the Admiralty Chart of 1879, is sand and shells. Whereas the survey of 1955 indicates rock. Subsequent trial bores have also indicated that the overburden over the rock is practically non-existent. This indicates that the over-burden which existed in 1879 over the rock bottom has more or less disappeared over a period of years. The sea bed is very flat at Tuticorin, the 5 fathom contour being roughly 4.5 sea miles from the main-land and 1.5 sea miles from Hare Island. There are depths of 10 fathoms at distances of from about 10 to 13 miles off shore and there are pearl banks just within these depths as far southward as Kayalpattam about 12 miles south southward of Devil's Point. A 5½ fathom shoal is situated about 4½ miles south-east of Devil's Point and 7½ fathom shoal lies about 8½ miles south-east of Devil's Point.

(c) *Borings*: The trial bores undertaken by the Tuticorin Port Trust at the instance of the Ministry of Transport on the alignments of the various proposals for port development, carried out in consultation with the Geological Survey of India show rock in varying thicknesses through-out the harbour area. The rocks are mostly calcareous grity sand stones and impure lime stones. Their hardness also varies from soft to very hard. Drawing No. IPDC/8 shows the location of the borings and the details thereof.

(d) *Tides and currents*: The tidal streams at Tuticorin set in a northerly direction with the flood tide and in a southerly direction with the ebb. A feature of the tides here is its susceptibility to the influence of the winds. Sudden changes of the level of the water as much as 1 ft. in one hour due to winds have been recorded in the past. The currents along the coast of Hare Island generally set with the winds varying in strengths from 1 to 2 knots. At the change of the monsoons they are weaker and variable. It is reported that when there is a lull in the monsoon, there is a tendency in the currents to set into instead of across the Gulf of Manaar. The tidal particulars with reference to the Admiralty Chart Datum which is also the level of the zero of predictions is given below:

Mean low water springs	+0·6
Mean low water spings	+0·7
Mean low water neaps	+1·6
Mean sea level	+1·9
Mean high water neaps	+2·1
Mean high water springs	+3·2

(e) *Winds*: In the gulf of Manaar from about the middle of November, the north-east monsoon is ushered in by lighting and heavy rains and lasts till the end of January. During this period, the wind blows steadily from the north-north-east along the coast near Tuticorin. By February, the winds on the coast assume a character of land and sea breezes. The sea breezes gradually become of minor duration after February and increase in force till about the middle of May. Towards the end of April, at nights, the wind becomes light invariably and squalls and showers of rain may occur. The sky becomes over-cast in May, clouds rise over the ocean and off shore winds begin to blow continuously at Tuticorin. The south-west monsoon is strengthened in June. Showers become less frequent in July but the weather is wet and hazy with generally a fresh breeze. Fresh south-westerly and west-south-westerly winds continue in August and September but the weather is generally fine; in the afternoon the breezes are strengthened and are accompanied with occasional squal and rain. The atmosphere often remains hazy in September. October has more unsettled weather and at times there are heavy sqalls with rains towards the end of the month. During November upto the advent of the

north-eastmonsoon, the winds are light and variable between north-east and north-west and the weather is very unsettled with frequent squalls and rain. The usual highest intensity of winds during either season at Tuticorin is about 5 in the Beaufort Scale. The sea is generally choppy at the roads during these seasons though permitting overside handling of cargo. A wind rose for Tuticorin has been prepared from the data collected by the recently established observatory at Tuticorin for the year 1956-57. This is shown in Drawing No. IPDC/7 attached to this report.

(f) *Cyclonic storms*: A study of the tracks of the cyclonic storms indicate that the cyclones in the Gulf of Manaar generally originate in the southern latitudes in the Bay of Bengal which travels across Ceylon and enter the Gulf of Manaar either travelling across the Gulf and entering the Indian coast between Pamban and Cape Comorin or travel further south across the mouth of the Gulf passing directly to the Arabian Sea without touching India, the effect of which nevertheless being appreciable in the Gulf of Manaar. The months of November and December are worst as far as cyclones in the Gulf of Manaar are concerned. Only a small percentage of the cyclonic storms originating in the Bay of Bengal however enter the Gulf of Manaar. An analysis of all the cyclonic storms in the Bay of Bengal during a period of 63 years from 1891 to 1952 indicates that only 13 passed through the Gulf of Manaar. The swell produced by the cyclones in the Bay of Bengal generally do not enter the Gulf because of the barrier between the Gulf and the Bay of Bengal formed by Adam's Bridge, Rameswaram Island and Thonnithura Peninsula. The cyclones in the Arabian sea form generally at higher latitudes than Cape Comorin and therefore have little influence in propagating swell in the Gulf. The winds associated with the cyclones especially those emanating from the Bay of Bengal may, however, generate quite a sea due to the fetch of the sea from Adam's Bridge to Tuticorin.

(g) *Waves*: The sea off Tuticorin is comparatively well sheltered. The waves during the Northeast monsoon period are the more predominent, but their maximum height seldom exceeds 5 ft. This is due to the presence of Adam's Bridge as explained before which breaks the fetch in this direction. The fury of the south-west monsoon is also not felt near Tuticorin due to the shelter offered by the mainland, though waves entering the Gulf from the Arabian Sea produce wave heights of the order of 5 ft. during the south-west monsoon.

(h) *Littoral sand drift*: Comparative study of all the previous hydrographic surveys at Tuticorin indicate that there was a gap between Hare Island and the mainland known as the Devil's Pass. This pass has since been closed by silting. Prior to the natural closure of Devil's Pass, there was a continuous littoral sand drift into the harbour through the Pass from the south. Investigations carried out in the

past by the Harbour Engineer-in-Chief to the Government of Madras, indicate that the source of the sand is from the River Upar Odai which debouches approximately 3½ miles south of Devil's Pass. After the closure of Devil's Pass by about 1912, the bay of the south is reported to be silting up. It is probable that a certain quantity of sand veers around Hare Island and finds its way into the harbour. An hydrographic survey and investigation carried out by the Harbour Engineer-in-Chief to the Government of Madras in 1928 indicated that the accretion at Devil's Pass was in the region of 6 million cubic yards since 1912 or at an average rate of 3,75,000 cubic yards per annum.

(i) *Silting*: The Bay formed by Hare Island and the main land is now comparatively free from silting. A study of successive hydrographic charts indicate only a slow rate of silting in this area. The Boat Channel from the existing piers at Tuticorin dredged to about 12 ft. below L.W.O.S.T. and 400 ft. wide silts at the rate of approximately only 3 inches a year. The total quantity of dredging which is carried out by the bucket ladder Dredger "Tuticorin" in the Boat Channel and alongside the warves and jetties is only of the order of one lakh cubic yards per year. An examination of the hydrographic chart prepared by the Indian Navy in 1955 also reveals that gradual silting is occuring on the eastern side of Hare Island. As compared with the Admiralty Chart prepared in 1879, the three fathom contour has shifted by approximately 1000 ft. in 76 years. This silting, however, is only slight and can be easily taken care of by dredging in any approach channel that may be dredged from the sea to the shore.

Port development

Development of Tuticorin Port into a deep-sea harbour with alongside facilities

5.53. The Committee considered the various schemes put forward in the past for the development of Tuticorin into a deep-sea harbour and examined their comparative costs as prepared in the Ministry of Transport. With the rapid growth in the size of ships in recent years, the Committee felt that from the navigation point of view the dimensions adopted for the turning basin and approach channel should be more than what had been proposed in the various schemes of the past. Considering the pattern of trade and the type of steamers which may be used for the trade at Tuticorin in the near future, the Committee was of the opinion that the largest steamers which the port will have to cater will be one having an overall length of 600 ft. and a loaded draft of 30 ft. The Committee then appointed a Technical Sub-Committee consisting of Shri H. P. Mathrani—Chairman, Capt. W.B. Piggot, Shri K. N. Srinivasan and Shri I. G. Chacko—Member Secretary, to examine the dimensions and bed levels required for berths, turning basin and approach channel and to find the most economical location and design for the harbour.

5.54. The Sub-Committee examined the question and decided that for 600 ft. long and 30 ft. draft ships the approach channel should be 500′ wide at the bottom with its bed 34′ below L.W.O.S.T. to enable these ships to use the channel with safety at high water neaps. For the turning basin it was decided to have a 1200′ diameter turning basin with its bed 32 ft. below L.W.O.S.T. For berths it was decided to have four berths with the same bed level as proposed for the turning basin.

5.55. The costs of a port complying with the above requirements were worked for all the alternative alignments and it was found that one of the two alternative alignments previously suggested by Shri Mathrani was the cheapest. Again along this alignment different locations of the turning basin and berths were tried and the most economical scheme decided upon. In essence, the scheme consists of having an Island Harbour in the sea connected to the shore by two embankments of about one mile in length to carry road and rail lines. An Island will be reclaimed from the sea on which the dock and other port facilities would be located. The turning basin will be sited on the eastern side of the Island and will be protected by the two inclined breakwaters. The layout of this project along with the past proposals is shown in Drawing No. IPDC/7 attached to this report. A detailed lay-out with cross sections of the proposed breakwater and reclamation bunds is shown in Drawing No. IPDC/9. The cost of this project for a 30 ft. harbour with 4 alongside berths, two for coal, one for salt and one for general cargo works out to roughly Rs. 10.27 crores as per estimate given in Appendix XIV.

Normal development at Tuticorin

5.56. Pending the decision of the Government of India regarding Tuticorin's future as an all-weather port with alongside facilities, the Committee felt that certain normal development works are necessary even if Tuticorin has to continue as a lighterage port for a few years and that these should be undertaken immediately. These facilities will not be wasted even if an alongside port is developed at Tuticorin. These works which may be given first priority are: the acquisition of a 300 H.P. diesel tug for towing country craft and barges carrying dredged spoil for reclamation; the acquisition of 2 number 2 ton mobile cranes as the port at present has no mobile cranes; the purchase of a 2½ cubic yard dumb grab dredger with three mud punts for dredging alongside wharves; the acquisition of 3 Nos. 300 ton dumb barges and one dumb barge with reclamation and diluting pumps and pipe line, so that the dredged spoil can be utilized for reclaiming land which will be a great asset to the port instead of the material being dumped into the sea and thus being wasted as at present; the construction of a small slipway for port craft and provision of workshop equipment; and the removal of the wreck of "Galatia" which hinders navigation at present. The cost of these works is estimated to be Rs. 27·0 lakhs as per details given in Appendix X. Certain other works which are also considered necessary by the Committee, but which may be given second priority are; the reconditioning of the port's bucket ladder dredger "Tuticorin" and the extension of its ladder to 30 ft. which has been thought to be feasible by the builders and the construction of essential quarters for port staff. The cost of these works is estimated to be Rs. 9·5 lakhs as per details given in Appendix X.

The economics of a deep-sea harbour at Tuticorin

5.57. The economics of a deep-sea harbour at Tuticorin were worked out by the Committee as per details given in Appendix XV attached to this report. It is seen that in the initial stages of the life of the new deep-sea harbour at Tuticorin, the port would suffer an annual deficit of Rs. 31 lakhs on the basis of full allowance being made for depreciation and interest on capital outlay at 4½ per cent. The Committee is, however, of the opinion that projects of this nature cannot be expected to pay for full depreciation and interest in initial stages. Later on as the traffic grows, as is likely, the deficit will disappear. In view of this and the reasons given in para 5.51 above the Committee recommends the development of Tuticorin as an all-weather alongside port with four berths in addition to the developmental works immediately required for the present lighterage port.

Chapter VI

KERALA STATE

Introduction

6.1. The State of Kerala on the western strip of the Indian Peninsula lies between 8°-30′ and 13° north latitudes and 75° and 77°-30′ east longitudes and has a coast-line of 360 miles in length. It is a narrow strip of land bounded on the east by the western ghats and by the Arabian Sea on the west. In the State are located the two intermediate posts of Kozhikode with its sub-port Beypore and Alleppey.

6.2. The State is rich in plantation produces which find a ready market abroad. These are tea, coffee, cashew-nuts, pepper and cardamom which are exported through the ports of the State. The State also grows rubber in large quantities which are consumed in the country itself. Though rice is grown in the rich Kuttanad region, the State is deficit in the production of rice. Other agricultural produces of the State are tapioca, areca-nuts, cocoanuts, and sugarcane. The State is also rich in forest wealth and is noted for its resources of timber including teak, ebony, rose wood, black wood and various varieties of soft wood. Timber is exported through the ports of the State for coastal distribution.

6.3. In the Alwaye region of the State, some 10 miles from Cochin, are located several industries, such as paper, chemicals, fertilizers, aluminium, rayons and textile mills. There are several cashew-nuts factories located near Quilon which imports cashewnut from Africa and exports finished cashewnuts to various foreign countries. At Beypore, there are several tile factories,, the products of which find an outlet through the port for coastal distribution. Fishing is another industry all along the coast and dried fish as well as deep frozen fish is exported to foreign countries, especially Ceylon which imports dried fish and the U.S.A. which imports deep frozen prawns.

6.4. The State possesses a wide variety of valuable mineral products. The beach sands of Kerala contain the much valued and strategic mineral. monazite, along with zircon and ilmenite. The latter is exported in large quantities to foreign countries. The extensive white clay deposits of Kerala contribute to the flourishing ceramic industry of the State. There are also abundant resources of mica, graphite, lime stone, quartz sand and lignite.

6.5. The intermediate and minor ports of the State are divided into two sections for purposes of administration. The northern section with headquarters at Kozhikode is under a Principal Port Officer. The southern section with headquarters at Alleppey is administered by the Additional Principal Port Officer. A small engineering organization has recently been built up in the northern section for carrying out the design, construction and maintenance of the engineering works. The work in the southern section is carried out by the Chief Engineer of the State, Public Works Department.

6.6. Though the Committee visited Alleppey Port, the Committee felt that in view of the small trade at Alleppy at present with little prospects of any appreciable increase in the next few years especially due to the proximity of the major port of Cochin 40 miles distant, which is well connected by road and inland water-ways to Alleppey, there was no need for the Committee to consider any recommendation for port development at Alleppey. This port has already fairly developed port facilities including a pier, transit sheds and warehousing accommodation. The Committee did not go into the question of minor improvements at Alleppey port to enable the port to handle the existing traffic in an efficient manner.

The proposed new intermediate port at Neendakara

General

6.7. The former Travancore-Cochin Government had proposed in 1955 the construction of a pier in the open sea at Quilon during the Second Five Year Plan to cater for the Quilon trade consisting mainly of 30,000 tons of cashewnuts. A technical on the spot study carried out by the Ministry of Transport at that time indicated that Neendakara located about six miles north of the open beach at Quilon in a sheltered lake known as the Ashtamudi lake which had a direct opening to the sea, would be a better site for port development if the needs of the entire region were taken into account.

6.8. The former Travancore-Cochin Government appointed a Committee to determine the merits of Quilon and Neendakara. This Committee favoured the construction of a lighterage port at a new site, in the shelter of the Tangasseri head-land by constructing a break-water parallel to the shore. Tangasseri lies between Quilon and Neendakara and is closer to Quilon. This consideration led that Committee to favour Tangasseri.

Traffic Pattern

6.9. The main traffic in this region originates from two different localities. At Koilthotam, roughly 4 miles north of Neendakara, there are three ilmenite factories. These factories produce ilmenite and other rare minerals out of which roughly 3 lakh tons of ilmenite are exported every year through the open beach at Koilthotam to the U.S.A. and the U.K. These exports are carried out with difficulty from Koilthotam as there are no proper facilities there for shipping the ilmenite sand. According to the present practice, the sand is first bagged and carried by head load to small country craft known locally as 'Vallams', next by 'Vallams' over the breaker zone and then transhipped to larger 'Tuticorin' type sailing craft from which it is again loaded on to the ships in the anchorage after debagging. The cost of transporting the sand from the shore and loading it into ships by this cumbersome method works out to about Rs. 11.2 per ton, as per details supplied by the State Government which are given in Appendix XVI-A. Even this is possible only in morning hours as in the afternoons with the commencement of fairly strong sea breeze, which is a feature of this coast during the fair weather season, and the surf caused thereby, transport by 'Vallams' over the breaker zones becomes difficult. The actual shipping time that is available in a day is, therefore, only about 4 hours. The shipping rate for

ilmenite, therefore, seldom exceeds 1100 tons per day during the south-west monsoon period when the port is closed to traffic.

6.10. The second locality in this region from which traffic originates is Quilon town itself. At Quilon are located about 160 cashewnut factories engaged in processing cashewnuts. Due to the shortage of cashewnuts in India, a part of the raw cashewnut requirements of the factories has to be imported from the African countries. Again the processed cashewnuts are exported to the U.S.A. and other foreign countries. The total exports and imports of cashewnuts for the Quilon factories were 5520 tons and 16300 tons respectively during 1958-59. Due to the lack of any port facilities at all at Quilon, the bulk of the cashewnuts has to pass through Cochin situated roughly 100 miles to the north of Quilon.

6.11. A project sponsored by the Norwegian-Indian Foundation for the development of fisheries in this region, is located at Neendakara. A modern boat building yard, a mechanical workshop and a refrigeration plant and ice factory have already been built by the Norwegians. Eighty-six powered craft based on Norwegian designs have already been built at Neendakara. The boats are generally of two types, one type being 22′ × 6′-4″ 3′—2½″ powered by a 4-5 B.H.P. semi-diesel engine and the other type being 25′ 7′-10½″ 3′-10½″ powered by a 8 B.H.P. diesel engine. The project authorities also require an all-weather port at Neendakara for small fishing craft drawing about 4′ to enable the fishing operations to be extended during south-west monsoon period. At present this is not possible due to the shallow and unsteady nature of the bar during rough seas specially during the south-west monsoon. In 1958, the total catch at Neendakara was 3,200 tons.

6.12. The volume of traffic handled at Quilon and Koilthotam from 1950-51 to 1959-60 as well as the number and nett registered tonnage of steamers and sailing craft which visited these ports during this period are given in Appendices VIII & IX. Fish landings at Neendakara for the years 1955 to 1958 are given in Appendix XVI B.

Model Experiments

6.13. At the instance of the State Government and the Norwegian-Indian Project Authorities, model experiments were carried out at the Poona Research Station in respect of both the Neendakara and Tangasseri schemes. These experiments which have since been completed, indicate that a sheltered lighterage port at either of the two sites will be feasible. The recommended solution for the Neendakara scheme is the construction of two inclined breakwaters at the mouth of the lake, the south breakwater being 2040 ft. and the north 1140 ft. in length and extending upto the 1½ fathom contour. This will enable the channel to be maintained at 9 ft. below L.W.O.S.T. Periodical dredging on either side of the breakwater to take care of the accumulation of sand due to littoral sand drift, if any, will also have to be undertaken. In the Tangasseri scheme, the solution recommended is the construction of a breakwater 800 ft. in length, parallel to the shore commencing from Tangasseri point. In this case, to enable fishing craft to use the port, it will be necessary to construct a navigable canal from the Tangasseri cove to the Ashtamudi lake.

The site of the future Port

6.14. The Committee considered three schemes for the development of a new port at Quilon, namely, the scheme for construction of open piers at Quilon and Koilthotam, the Tangasseri scheme and the Neendakara scheme and came to the conclusion that taking into consideration the needs of the entire region, Neendakara should be the site to be developed and for the following reasons:—

(a) Neendakara being central to both the Quilon and Koilthotam trade, can serve the interest of both.

(b) The Fisheries Development Project sponsored by the Norwegian Project for which an all-weather port for small fishing craft is required is already located at Neendakara.

(c) From the comparative cost worked out by the State Government for the Neendakara and Tangasseri projects, it is seen that the former will cost Rs. 1·05 crores and the latter Rs. 1·25 crores. Thus the Neendakara scheme is cheaper by Rs. 20 lakhs in capital cost.

(d) In the Neendakara scheme, the port can also cater for rail borne traffic. There is already an existing railway siding on the southern bank of Ashtamudi lake connected to the meter-gauge system of the region. This siding can be extended very easily by a few hundred feet to the new whraves proposed by the Committee for handling the Quilon traffic.

(e) The canal required for the Tangasseri scheme will pass through valuable and partially built up land and will involve the construction of one lock and four high level road bridges. The fisheries and the ilmenite interests have indicated to the Committee that even if this canal is excavated it will not be very useful as owing to the delays involved in passing through this lock and additional distance their craft was not likely to use the Tangasseri harbour. Ilmenite interests were very emphatic in this respect.

(f) The cargo working from exposed piers as at Quilon and Koilthotam could be slow and expensive. The exposed pier will have to be constructed to an elevation of 18 ft. above L.W.O.S.T. to prevent over-topping by waves. Thus cargo will have to be lifted and lowered to a much greater height or depth compared to the sheltered wharves in the Neendakara scheme. The piers being exposed it will not be possible for the lighters and craft to come alongside for more than about 4 hours in a day, thus slowing down the shipping rate.

(g) The Norwegian Foundation have communicated to the Committee that in view of their great interest in developing Neendakara port for fishing, they will be willing to consider financial support to the Neendakara scheme in the shape of foreign exchange required for this project.

Future Traffic

6.15. The future traffic which is likely to pass through a new port constructed at Neendakara is estimated by the Committee to be roughly 4 lakh tons consisting of 3 lakh tons of ilmenite sand, 50,000 tons of cashewnuts and 50,000 tons of general cargo.

Engineering Features

6.16. Neendakara is located roughly six miles north of Quilon town at the mouth of the Ashtamudi lake. This lake is open to the sea throughout the year. Systematic hydrographic surveys carried out by the Norwegian-Indian Project Authorities indicate that a minimum depth of 4 to 5 ft. over the bar is available in its natural state at the worst season at low tide. The channel is liable to oscillate depending upon the set of the sea during the various seasons. The tidal range at Neendakara is of the order of 3 ft. at springs and 1.5 ft. at neaps. The Kallada River with an estimated flood discharge of 90,000 cusecs discharges into the Ashtamudi lake. The sediment load of this river is not known but in view of the vast expanse of the Ashtamudi lake, the effect of this sediment load on the mouth of the Ashtamudi lake is likely to be of little importance.

6.17. Exhaustive analysis of wave directions, periods and heights carried out by the Poona Research Station indicate that the predominant direction of strike during the south-west monsoon period from July to September is from west to west-south-west. The height of the waves seldom exceeds 10 ft. and have periods of about 12 seconds.

6.18. The Committee was not able to establish the direction of the littoral sand drift on the coast at Neendakara. Observations at Cochin and Alleppey during 1959 monsoon showed the coastal current from north to south. The Meteorological Department publications and the West Coastal of India Pilot also show the directions of the current in south West Monsoon from north to south. Tangasseri cove on the south of a premontory is free from silt. Thus the indications are that the littoral drift in South-West monsoon is from north to south and this is the season when the drift predominates. There are also indications that the magnitude of the drift is small. To take care of the littoral drift it will be necessary to dredge a sand trap on the silting side. For this purpose a sand pump may be provided on the breakwater on the silting side of the bar. The side and the size of the pump may be decided upon after detailed observations after construction of the breakwaters.

Port Development

6.19. The Committee recommends the development of a new intermediate port at Neendakara in the following manner: wharves at Koilthotam in the backwater side, one for each factory to cater for ilmenite trade; a wharf with transit shed on the Quilon side with road and rail approaches for the trade in cashewnuts, other general cargo and rail borne trade, if any, in the future; the widening and deepening of the existing canal from Koilthotam to Ashtamudi lake to enable sea-going lighters to work from the Koilthotam wharves to the anchorage through all stages of the tide; the dredging of the Ashtamudi lake to allow lighters from the Quilon wharf and Koithotam wharves to go direct to the anchorage through Neendakara at all stages of the tide; the stabilisation and improvement of the bar by the construction of breakwaters as suggested by the Poona Research Station; and the provision of a fleet lighters and tugs for the transport of cargo from the wharves to the anchorage and back. This project, costing Rs. 92.5 lakhs may be given first priority. The breakup of costs for the various items are given in Appendix X. The Committee's recommendations are shown in Drawing No. I.P.D.C./10 attached to this report. Pending the provision of a sand

pump on the breakwater on the silting side, maintenance dredging of the approach channel, if found necessary may be carried out by one of the dredgers from the dredger pool proposed to be created under the Ministry of Transport and Communications.

The Economics of Port Development

6.20. The economics of port development at Neendakara estimated to cost Rs. 92·50 lakhs for handling 3 lakh tons of ilmenite sand, 50,000 tons of cashewnuts and 50,000 tons of general cargo has been studied by the Committee. If the scheme recommended by the Committee is accepted, it will result in a nett annual return of 4.85 per cent on the capital as per details given in Appendix XVII attached to this report. There will also be certain indirect benefits which will accrue from the project. The saving in transport cost of roughly 13,000 tons of cashewnuts which at present are handled in fair weather at Cochin port will amount roughly to Rs. 2·00 lakhs per annum on the basis of the actual cost of the transport of this commodity at the rate Rs. 16 per ton. The saving in handling cost of 3 lakh tons of ilmenite at Koilthotam by the provision of improved facilities at Neendakara works out to about Rs. 9 lakhs per annum at the rate of Rs. 8·00 per ton as per details given in Appendix XIX as against Rs. 11·2 per ton now being incurred. This scheme will also be of benefit to fishing industry to a great extent making it possible to carry on fishing during the south-west monsoon period thus increasing the annual catch of fishing.

The ports of Kozhikode and Beypore

General

6.21. The port of Kozhikode, an open roadstead, is located on the Arabian Sea roughly 76 miles north of Cochin and 120 miles south of Mangalore. The Port of Beypore, a sub port of Kozhikode, is situated at the mouth of the Beypore river, roughly 6 miles south of Kozhikode port. The ports of Kozhikode and Beypore are administered as one unit by a Port Officer. It is the most important intermediate port of Kerala State and handles roughly 3 lakh tons of traffic per annum. The Port of Kozhikode is of historical importance. Vasco de Gama landed at this port in 1498 and subsequently the British took possession of the town in 1650 after the Mysore wars. Drawing No. IPDC/11 and IPDC/12 show the lay-outs of the existing ports at Beypore and Kozhikode. Appendix VII gives a list of the existing port facilities at these ports.

Traffic Pattern

6.22. The hinterland of Kozhikode and Beypore ports includes the taluks of Kozhikode, Wynad, Ernad, parts of Walluvanad and the adjoining territories of Coorg and Mysore. The trade originating from or destined to this region, passes through these ports and consists mainly of timber, tea, rubber, pepper and coffee exports to foreign countries and coastal exports of timber, coconuts and tiles. The imports through these ports consist mainly of salt, sugar, rice, oilcakes and general cargo from other Indian ports and cashewnuts and dates from foreign countries. Out of the traffic of 3·33 lakh tons handled in 1957-58, the percentage carried by sailing craft was 78. The traffic has shown a steady rise from 1·9 lakh tons in 1950-51 to 3·33 lakh tons in 1957-58. In 1958-59, the traffic fell

to 2,84,000 tons. The tonnage of imports and exportnd exports handled at and Kozhikode from 1950-51 to 1959-60 and the nd the number and ne tered tonnage of steamers and sailing craft which visirhich visited these port this period are given in Appendices VIII and IX atnd IX attached to the

Future Traffic

6.23. The hinterland of port, a narrow coastow coastal strip with a major port, 90 miles to the south and Mangalore,angalore, another imp port, 120 miles to the north, and restricted by tled by the almost en Western Ghats on the east, limits the traffic which r which may pass the port to that which will originate from or destined destined to this na of land. Due to the gradual increase in the product production in this re trade at Kozhikode and Beypore has gradually incually increased from tons in 1950-51 to 3.33 lakh tons in 1957-58. For-58. For the purpo casting the future traffic in the next 10 years, the Cos, the Committee ha assumed only the same rate of increase as shown s shown in the past basis the traffic at Beypore and Kozhikode by 1967- by 1967-68 will be i the order of 4·75 lakh tons.

Engineering Features

6.24. The main feature of engineering interest; interest at Kozhiko presence of 2 mud banks to the north of Beyp of Beypore near I These mud banks are a feature of the Malaba Malabar coast. the extraordinary property of tranquillising the seg the sea above th roughest monsoon weather. From times immemo immemorial these ha have been used by sailing craft visiting Kozhikod&ozhikode as a safe In size and shape they resemble a parabola, haviola, having a base o 6 miles and a seaward projection of 2 to 3 mileo 3 miles. One of banks is located approximately 6 to 7 miles r miles north of Be Kozhikode and the other immediately south of Kuth of Kadalur Point is a tendency for these mud banks to move up and up and down the in certain limits. This movement is caused by used by severe storm sea combined with littoral currents and has a has a three-fold (a) an apparently stationary bank lying at a roaat a roadstead in t might suddenly invade the beach and put the piet the piers out of (b) it might travel away from the roadstead adstead and upset arrangements in rough weather; (c) it might crossght cross the approa of a port and put it temporarily out of action, wlction, which has no so far, but even its possibility demands rigorous rigorous care and w A Consultative Committee appointed in London London had und the past, a detailed study of these mud banks. Aanks. After several research and experiments, the Committee came e came to the conc the composition of the mud was that of the late the laterite hinter was thus also its origin. The mystery of the quit the quite waters o banks was due to three causes:

"(a) The unique fineness of the mud andmud and its high suspension;

(b) The projection of the toes of the ban the banks over the tours of the sea-bed which in heavyin heavy weather, attacked by the ground swell in itsll in its effort to mality of contours;

(c) The raising of a jelly-like barrier over the toes in which two forces are at work; one near the surface, due to the kinematic viscosity of the mud suspension and the other near the bottom, known as the thixotropic drag. Both these ensure tranquillity within a 'Transition' zone, shoreward of which the sea becomes as calm as a lake on a windless day."

No detailed observations on the movement of the banks near Kozhikode have been made in the past. A record of the unusual behaviour of the mud bank in one instance is, however, available. In October, 1937, the north pier at Kozhikode, alongside of which there is generally about 15 ft. of water at its outer end, suddenly appeared high and dry above the mud bank. This followed a storm at Kozhikode in the previous month, but apart from this it had been difficult to suggest a reason for this behaviour.

The Beypore River

6.25. The Beypore river which has its origin in the Western Ghats, has an approximate catchment area of 1100 sq. miles. The river is formed by the junction of a large number of steams in the Nilamber Valley, some of these streams rising in the Nilgiri Plateau. The maximum discharge of the river based on the data available for comparative catchments in the vicinity, works out to 1,62,000 cusecs by Ryve's formula. No information on the sediment load of the river is available. The Beypore river is navigable for a distance of approximately 20 miles. There is a bar at the entrance of the estuary which carries about 5 to 7 ft. of water at L.W.O.S.T. After the monsoon freshets, the bar is about 7 ft. deep and the depth diminishes to about 5 ft. or 4 ft. by April or May. The channel width also reduces from 800 ft. to 400 ft. in the same period. Inside the river, depths of the order of 6 to 9 ft. are obtainable beyond the gut while at the gut, a depth of about 20 ft. is available. Chaliyar, a small river winding along the coin joins the Beypore near its mouth. The tidal range in the Beypore estuary is 4 ft. at springs and 1 ft. at neaps. The mean higher high water is 4:6 ft. above chart datum.

Littoral Sand Drift

6.26. There is no observed data on the littoral sand drift at Beypore. There are, however, some indications of the nature of the littoral drift on this coast. In the monsoon when the drift is maximum the littoral current is from north to south. This has been confirmed by observations at Mangalore in the north and Cochin and Alleppey in the south. Direction of spirits at the mouth of the rivers entering the sea in this region is also southward. The Beypore river itself enters the sea in a south-westerly direction. The Kallayi river to the north of the Beypore River also faces south. The Elattur River north of Kozhikode debouches into the sea facing south after flowing behind a sand spit. Still further north below Kadalur Point there exists a soft mud spit again pointing towards the south. The direction of entries of the rivers and the shapes of the spits are indication that there is a predominant southerly sand drift and current. The quantum of drift, however, is likely to be small. There is an old sea wall immediately south of the Beypore river mouth connecting the shore to some outcrops of rock some 900 ft. off shore. A comparative study of the hydrographic survey charts of 1887, 1913 and 1956, indicates

no appreciable building of a spit on either side of the river mouth or the sea wall, indicating that the effect of sand drift over a period of years is not considerable.

Port Development

6.27. The Committee having reviewed the present method of cargo working at Kozhikode and Beypore and keeping in mind the future needs of traffic, felt that certain improvements at these ports are necessary to effect increased efficiency in operation and to cater for the additional traffic of the future.

Beypore

6.28. This port mainly caters for sailing craft traffic which is of the order of 1 lakh tons per annum, suffers from two main handicaps. The bar at the mouth of the Beypore river has only about 5 ft. of water at L.W.O.S.T. so that the larger sailing craft which frequent this port, are unable to enter the port at all stages of the tide. Secondly at present there is only a small wharf 220 ft. in length at Beypore. This wharf too is located on the silting side of the river and has a minimum depth of 2 to 3 ft. of water alongside, thereby restricting the working of the sailing craft. The Committee felt that a jetty 500 ft. in length capable of accommodating the type of sailing craft now trading with Beypore at all stages of the tide, should be provided. The foundation of the wharf should be designed for 12 ft. draft coasters so that the port can be developed for this type of craft at a later date. The exact sitting of the jetty, however, should be finalised only after a detailed hydrographic survey of the entire estuary has been carried out and plotted on a large scale plan. The proposal for the construction of the jetty including aquisition of land and electrification is estimated to cost Rs. 13,56,000. The State Government expects to spend Rs. 4,56,000 during the Second Five Year Plan period itself. The Committee recommends that the construction of the wharf should be given first priority for Beypore. Certain other items which are necessary are the acquisition of Nos. fixed electric wharf cranes, the construction of a transit shed and quarters for essential port staff, the provision of water supply and workshop equipment and the acquisition of a 150 B.H.P. diesel tug for towing lighters and country craft. The estimated cost of these works which may be given a second priority is Rs. 10.78 lakhs as per details given in Appendix X.

6.29. The State Government desired the Committee to examine the possibility of making Beypore an all weather deep draft port suitable for ocean going liners. Apart from the limited scope for development of traffic due to its limited hinterland the Beypore estuary directly faces the south west monsoon winds. Because of this the possible harbour site is not likely to be calm in this weather. Again the river upstream of the gut being only about 6 to 9 ft. deep it will be difficult to maintain by dredging a depth of 32 ft. that will be required for ocean going liners. The Committee, however, recommends that detailed observations be made in respect of waves, winds, tides, river discharge in floods and its silt contents and model studies undertaken. This is estimated to cost about Rs. 1,00,000 and may also be given first priority for Beypore.

Kozhikode

6.30. The Committee found that the present method of handling cargo on the pier by the existing slow and manually operated cranes is inefficient. The port site also lacked sufficient stacking place and transit area. The movement of cargo on the pier by the use of manually operated trollies is slow and inefficient. The Committee, in view of this and keeping in mind the future traffic potential, recommends the provision of electric cranes on both the north and south piers, estimated to cost Rs. 10,00,000 as a work of first priority for Kozhikode as per details given in Appendix X. Certain other works which are necessary are the construction of a transit shed at south pier; the construction of additional stacking areas at north pier; the provision of 2 small electric capstans at each pier for hauling trollies; and the construction of a signal station to improve the present system of communications between the shore and ship; these items estimated to cost Rs. 4.5 lakhs as per details given in Appendix X may be given second priority.

CHAPTER VII

MYSORE STATE

Introduction

7.1. The State of Mysore lies between Latitude 11°—30′—18″ N. and Longtitude 74°—78′ E. Prior to the States Reorganisation in 1956 the State was entirely landlocked without a coastline. As a result of the re-organisation of the States, the State has acquired a sea board of about 150 miles in which are located the intermediate ports of Mangalore and Karwar. The territory of the State may be divided into 3 well defined tracts, consisting of the western coastal strip, the mountain barrier consisting of Western Ghats and the platean east of the Ghats. The narrow coastal strip 30 or 40 miles wide stretches to the steep western face of the Ghats. The Ghats form a transport barrier through which the road and rail have to pass to connect the ports with the industries and mines located on the plateau.

7.2. The State is conspicuous for its agricultural, plantation and forest produce which consists of rice, ragi, maize, potatoes, pulses, gram, groundnuts, coconuts, sugarcane and cotton from the fields, areca, cashew, coffee and cardamum from the plantations and timber, sandal-wood and bamboos from the forests. The State is nevertheless deficit in the production of rice by about 3 to 5%. The timber from the forests finds an outlet by the sea route through the ports of the State for coastal distribution. Other products which pass through the ports are coffee, areca, cashew nuts, cardamum and coconuts.

7.3. The State is rich in mineral wealth. Iron ore from the mines in the Bellary-Hospe-Sandur region is being exported through several ports to foreign countries. During 1958-59, about 7·5 lakh tons of iron ore from these mines was exported through various ports. Iron ore deposits also occur in the districts of Chitaldurg, Tumkur, Mandya, Hassan and North Kanara. The total reserves of the State are estimated to be 500 million tons. Manganese ore deposits occur in the districts of Bellary, Shimoga, Chitaldurg, Tumkur, North Kanara and Bijapur. The reserves of manganese ore in the State are estimated to be 5 million tons. The average production of manganese ore during the last 3 years was 2·2 lakh tons. Except for about 10,000 tons per annum which is being consumed in the State, the balance is exported. Chromite reserves of all grades in the State are estimated to be a million tons and are found in the districts of Mysore, Hassen, Chikmaglur. Other important minerals of the State are gold from the Kolar and Hatti mines, bauxite, china clay, feldspar, magnesite, asbestos, kayanite, mica, ochres, magnesium, lime stone, soap stones and pyrites.

7.4. The industries of the State are located near Bhadravati. Bhadravati is the seat of Mysore's steel industry, around which have grown a number of industries manufacturing cement, paper, ferro silicon and spun pipes. With the completion of the Bhadra Reservoir and the Sharavati Project, power would be increasingly available in this region,

which will give a further impetus to the industries. Important industries located at Bangalore include the Hindustan Aircraft Ltd., the Hindustan Machine Tool Ltd., and the Government Telephone Factory. In addition the State has several tile factories situated at Mangalore which form an important item of exports from Mangalore Port, an automobile springs factory Mangalore, a fertiliser factory at Belagala, the Government Implements Factory at Hassen, Kirloksar Machine Tool Factory at Harihar, sugar factories in Mandya and paper mills in Mysore.

7.5. Mangalore is one of the two intermediate ports in India which has a Port Trust. Though under the State Government, the administration of the port is carried on by the Port Trust with the assistance of a full-time Port Officer and Secretary. The Port Trust also has an independent engineering Sub-Division. For the management of all intermediate and minor ports other than Mangalore, a minor port organisation headed by a State Port Officer was created soon after States Reorganisation. An engineering organisation is also being built up.

The Port of Mangalore

General

7.6. Mangalore is one of the most important ports on the West Coast of India between Bombay and Cochin and is classified as an intermediate port. This port is located on the Arabian Sea roughly 196 miles south of Marmugao and 190 miles north of Cochin, at the confluence of the rivers Netravati and Gurpur. Mangalore is an excellent lighterage port, the port facilities being located in the Gurpur estuary. Drawing No. IPDC/14 shows the existing port facilities at Mangalore. Appendix VII gives a list of the port facilities at Mangalore.

Past History

Study by Sir Francis Spring.

7.7. The need for the development of an all-weather port on the stretch of the Indian coast line between Marmugao and Cochin has long been felt. The former Mysore State Government as early as 1915 invited Sir Francis Spring, late Chairman, Madras Port Trust, to make a study on the feasibility of developing Bhatkal a small roadstead some 300 miles south of Bombay and 300 miles north of Cochin, into an all-weather port. At that time Mangalore was not a part of Mysore State. The scheme as visualised by the former Mysore State Government was the construction of a deep sea port at Bhatkal and the extension of the Shimoga branch of the old Mysore State Railway to Bhatkal. Sir Francis Spring made a first report on the harbour scheme.

The Report of Mr. Lyster.

7.8. The former Mysore State Government in 1919 further pursued this scheme by inviting Mr. A. G. Lyster of the firm of Messrs Sir James, Wolf, Barry and Co., to make a study of the harbour scheme at Bhatkal. Mr. Lyster produced schemes of separating the Bay of Bhatkal from the open sea by groynes and developing an inner creek known as the Sharabi river, as a fully protected harbour. This scheme was then estimated to cost Rs. 144 lakhs and was expected to enable the proposed port when developed to deal annually with 2,30,000 tons of cargo. He also described

another feasible scheme, different in detail but not in essentials, which would admit a better expansion but would be a good deal more costly. He considered that the first instalment of works for the former scheme should be initiated which would cost about Rs. 1 crore leaving room for future expansion up to the total figure of Rs. 1·44 crores.

7.9. At that time in the year 1919, it was estimated that trade amounting to one million tons of cargo would be required to justify the expenditure of Rs. one crore, but the traffic survey made in 1919 only promised about 2 lakh tons a year. The scheme was therefore dropped in the year 1923 and was not revived until much later.

The Ports (Technical) Committee.

7.10. The Ports (Technical) Committee which was appointed by the Government of India in 1946, to investigate port development in India, was asked to consider the Bhatkal project. The Ports (Technical) Committee felt that the construction of a harbour at Bhatkal along with a railway connection connecting Talguppa and Bhatkal 49 miles in length, would greatly reduce the rail haulage from the coast to the industrial hinterland of Mysore and would materially assist in the development of Mysore. The Ports (Technical) Committee estimated an annual traffic of 4 lakh tons. That Committee also found that the construction of the port will be remunarative, and that the investment on the port will be able to earn about 3 per cent. The Committee concluded that the construction of a harbour at Bhatkal was both an economical and good financial proposition and felt that this development was essential for providing a good economic outlet for the trade of the large and rich hinterland of the Mysore State lying behind it.

The West Coast Major Port Development Committee.

7.11. The Government of India appointed a committee known as the West Coast Major Port Development Committee in February 1948. One of their terms of reference was as follows:—

> "(a) whether a deep-sea port between Mormugao and Cochin for the accommodation of ships of large size and tonnage at all seasons of the year is required;
>
> (b) if so, where it should be sited, having regard to economy of construction and maintenance of the port and allied transport developments required and having regard to the needs of the entire area; also what measures are necessary for establishing it;"

This Committee considered 4 ports as possible sites for a major port. These were: Karwar, Bhatkal, Malpe and Mangalore. In their report, the Committee recommended that a major port was necessary in this region and recommended Malpe, about 40 miles north of Mangalore, as the most suitable site for development into a major port. Their recommendations were based on the following:—

> "1. The islands off-shore at Malpe form the nucleus of a sheltered harbour. Although groynes would be required to link up the Islands with the shore, most of the protection in deep water has already been provided by nature.

2. The sub-soil investigations reveal that the harbour could be dredged without encountering rock.

3. There is a good entrance from the sea.

4. The total area of the harbour would amount to over 400 acres, which is ample for a very large port.

5. Only a small river enters the harbour, and this could easily be diverted. There would thus be no dredging problem.

6. The geographical position is favourable in relation to the hinterland. The railway haul from Malpe to Bhadravati is 42 miles less than from Mangalore and 44 miles less than from Karwar.

7. There is extensive land available for the port estate, and to attract new industries.

8. Malpe is only 60 miles from Jog where hydro-electric power is available."

7.12. The West Coast Major Port Development Committee in 1948 estimated that with the construction of rail link and a deep sea port the traffic at this port would be of the order of 5·5 lakh tons per annum by 1950-51, 6·3 lakh tons by 1955-56 and 8 lakh tons by 1961-62. That Committee felt that the main hinterland which is to be served by a new major port in this region was Mysore with the focus at Bhadravati and they forecast the major share for Malpe Port to originate from this region. These estimates, however, excluded the export of iron ore for which a great demand has since developed.

Traffic pattern

7.13. Since 1950-51 upto 1958-59, the Port of Mangalore has been handling a steady traffic of the order of roughly 3 lakh tons per annum. An analysis of the traffic handled during 1957-58 indicates that out of the total of 2,99,000 tons, imports were 88,100 tons and exports 2,10,903 tons. Sailing vessels traffic accounted for 86·5 per cent of the total trade during 1957-58. The principal commodities handled during 1957-58 were the imports of cashew nuts (6,236 tons), copra (679 tons), fish and fish-manure (4,189 tons), firewood (7,187 tons), hardware and cutlery (2,326 tons), rice and grain (7,875 tons), salt (28,945 tons), tobacco (257 tons), and general cargo (30,406 tons), and the exports of betelnuts and supary (10,358 tons), tiles (1,58,792 tons), cashew nuts and kernals (2,853 tons), coffee (8,852 tons), rice and grains (1,302 tons), timber (10,938 tons), tobacco (7 tons), pepper (153 tons), and general cargo (17,646 tons). Since 1958-59, however, a traffic in iron ore has developed. The traffic handled from April 1959 to March 1960 has increased to 4,35,445 tons including 1,56,969 tons of iron ore. During this year the proportion of steamer traffic rose from 13.5% in 1957-58 to 43.3%. The tonnage of imports and exports handled at Mangalore from 1950-51 to 1959-60 is given in Appendix VIII. Appendix IX gives the number and nett registered tonnage of steamers and sailing vessels which visited the port during this period.

Traffic Survey by the National Council of Applied Economic Research

7.14. A traffic survey to assess the future traffic potential of Mangalore was carried out in 1959 by the National Council of Applied Economic Research at the request of the Mysore State Government on the suggestion of this Committee. This survey reveals the following pattern and volume of traffic by 1966.

	Nature of traffic	Estimated tonnage	Remarks by National Council of Applied Economic Research
1.	Present Traffic	2,80,000	This is the average traffic at Mangalore during the last four years—mostly ocean traffic by boat.
2.	Increase as	70,000	As a measure of cautious estimation taken at 25% instead of 50% as the four-month monsoon stoppage would suggest, the increase would occur without Mangalore-Hassan link.
3.	Diversion of Bhadravati's traffic now dealt with at other ports as well as new traffic that Bhadravati will develop.	100,000 15,000	This diversion is taken at 33-1/2 % of Bhadravati's Third Plan requirements of coal, coke, furnace oil, scrap iron from Calcutta, etc., most of which came by sea cum rail till recently *via* Madras Port with transhipment at Bangalore or other points. Mormugao previously handled part of this traffic and Mangalore or Malpe would offer similar convenience if rail links are forged. A new traffic in the export of ferro-silicon—15,000 tons—may materialise, depending on the location of the steel alloy plant. The import of moulds for the spuin pipe factory is excluded.
4.	Coal	100,000	At present the hinterland gets 3 lakhs tons of coal and coke by rail, excluding what goes to Bhadravati. The coal despatches are bound to increase but here only a third of hinterland's present requirements are put in for use of railways and industries in the hinterland.
5.	Diversion of traffic from other ports as a result of Mangalore-Hassan link excluding exports of iron ore.	50,000	As a result of Mangalore-Hassan link, the hinterland will be knit closely to the port and industrial establishments in Mysore, Hassan, Harihar, Mandya, and towns other than Bangalore and Bhadravati will import and export *via* Mangalore instead of other ports as at present. Empty gunnies, cotton piece goods, potatoes, oil cakes, structural steel now coming in by different rail or sea routes are included in this traffic.

Nature of traffic	Estimated tonnage	Remarks by National Council of Applied Economic Research
6. Foodgrains (mostly wheat)	50,000	More than a million tons of food grains are imported into the country *via* Bombay. About 5% of this (on the basis of population) is credited for diversion of this traffic to Mysore Port.
7. Fertilisers	25,000	Credit at the present level of allocation of imported fertilisers to Mysore which comes *via* Madras or Cochin Ports. In the event of a tripel phosphate factory in the State, additional tonnage of raw materials could come in from Egypt or elsewhere at a port on the Mysore coast.
8. Salt	53,750	By 1966 the State would need 1,65,000 tons of salt. About 50% of this can come in at Mangalore or Malpe. But as already allowance has been made for 28,750 tons in the present traffic and its increase due to year round operation (items 1 and 2 above) only the additional traffic in salt is recorded.
9. Fish	5,000	In addition to 5,000 tons already included in 1 and 2 above.
10. Industrial requirements of Bangalore area	100,000	At present the industrial requirements of Bangalore for capital and industrial goods come through Bombay, Cochin or Madras Ports, mostly from the last. The industries in and around Bangalore constitute already a much bigger complex than at Bhadravati and are still growing. It is therefore credited with a traffic with the ports at least as high as that for Bhadravati in this estimate. For further remarks see text.
11. Miscellaneous and General cargo (due to increase in production of coffee)	94,305	At about 10% of the total traffic, as this type of traffic is generally not less than this percentage at Managlore or Malpe at present.
12. Total	9,43,055	The total excludes (*a*) Iron ore and manganese ore traffic, (*b*) likely exports of chromite, and most important of all (*c*) Mysore's intake of petroleum and petroleum products that could be discharged at Mangalore or Malpe. In the actual traffic at the ports, iron ore traffic will be important even in the first years of a deep sea port on the Mysore Coast.

An additional traffic which depends on planning and programme of the State Trading Corporation was estimated by the National Council to be as follows:

Traffic in iron ore and manganese ore	3 or 4 lakh tons.

7.15. The National Council of Applied Economic Research also made a comparative study between Mangalore and Malpe, and a summary of their recommendation is given below:—

> "In selecting the site for the deep sea harbour, two ports, Mangalore and Malpe are under consideration. After careful analysis of data it is considered that Mangalore has a better claim for development provided hydrographic survey do not reveal any fundamental disadvantage, and maritime conditions essential for deep-sea harbour are not against such developments."

Future traffic

7.16. The Committee estimated a future traffic of between 5 and 6 lakh tons per annum excluding iron ore but including sailing craft traffic of between 2·5 to 3·00 lakh tons at Mangalore if an all-weather deep drafted port is constructed at Mangalore and a railway link is made connecting Mangalore with Hassan for a distance of 123 miles: Drawing No. IPDC/13 shows the hinterland of Mangalore port.

7.17. On the basis of the export target of 150 million tons as detailed in Chapter II, there will be a short fall of about 2·0 million tons in port capacity of the country for handling iron ore export in the next 5 to 10 years. For this export, S.T.C. consider a 34 to 38 ft. draft port on the West Coast for receiving modern ore carriers essential so as to keep up the export tempo in iron ore. With the construction of the Mangalore-Hassan railway link, Mangalore will be well placed to serve the high grade and low grade iron ore mining areas of Mysore State. The deposits of high grade ore located in the Tumkur and Chitaldurg districts are estimated to be of the order of 276 million tons, the grade of the ores being equal to or in some cases even superior to the ores from the Bellary-Hospet region. The deposits of low grade ores from the Babubudan areas are estimated to be 546 million tons, the grades being suitable for blast furnaces. Even without drawing on the Bellary-Hospet ore deposits by means of a rail connection between Kottur and Harihar, it will be possible for the Port of Mangalore to be sustained by the deposits in the Tumkur. Chitaldurg and Babubudan areas. The State Trading Corporation visualises that with the construction of a link between Mangalore and Hassan a traffic in iron ore from these areas of the order of 2·0 million tons can be developed at Mangalore. Once this Mangalore-Hassan rail link is established, high grade ore can be loaded at Chitaldurg, Haliyuru, Amritpura, Chickajajur, Hosdurg Road, Tiptur, Banavar, Banasundra and Arsikere on the existing lines between Chitaldurg and Tumkur and low grade ore from Babubudan areas can be loaded at Kadur and Tarekere on the existing line between Kadur and Bhadravati. It will of course be necessary to build short stretches of the line from the loading points to the principal mining centres of low and high grade ores. The distance between Mangalore and Chitaldurg, the farthest

loading point of the high grade ore, will be only 230 miles *via* Hassan, the rail freight for this being Rs. 14·69 per ton. The distance from Kemmangundi, the principal point for the low grade ores to Mangalore *via* Hassan will be about 200 miles. the rail freight being Rs. 13·35 per ton.

7.18. The total traffic including iron ore which is likely at Mangalore in the next 5 to 10 years with the construction of an all-weather deep sea port at Mangalore and the railway link connecting Mangalore-Hassan will, be about 2·6 million tons out of which 2·3 million tons is estimated to be steamer traffic and the rest sailing vessels traffic. For this traffic, the Committee is of the view that an all-weather harbour with alongside facilities at Mangalore is necessary.

Comparative study between Malpe and Mangalore

7.19. In view of the opinion expressed by the West Coast Major Port Development Committee recommending Malpe as the most suitable site for the development of a major port in this region, the Committee went into the question of comparative merits between Malpe and Mangalore in great detail.

Port construction

7.20. For the purposes of making comparative estimates for a harbour at Malpe and Mangalore, the Committee first fixed the leading dimensions for harbour either at Malpe and Mangalore from the navigation angle as given below:—

Draft	Outer approach		Protected approach		Turning basin	
	Width	B.L.*	Width	B.L.	Width	B.L.
feet	feet	feet	feet	feet	feet	feet
30 . .	500·0	-34·00	350	-33·00	1200	-32·00
34 . .	503·0	-38·00	400	-37·00	1400	-36·00
38 . .	600·0	-42·00	450	-41·00	1500	-40·00

Based on these figures, the Committee estimated the comparative costs of building harbours for various drafts at both Mangalore and Malpe as follows. For obtaining rock levels at Malpe which was known to exist at Malpe at fairly high levels a series of probings were put down by the State Government at the instance of this Committee.

Site	Estimated cost including 1 mechanical berth and moorings		
	30 ft. draft	34 ft. draft	38 ft. draft
	Rs. in lakhs	Rs. in lakhs	Rs. in lakhs
Mangalore	1,000	1,025	1,100
Malpe	800	875	1,050

*Depth below L.W.O.S.T.

Port Maintenance

7.21. With the construction of artificial breakwaters at Mangalore extending approximately to the same bed contours as the off-shore chain of Islands at Malpe both Malpe and Mangalore from the point of view of harbour maintenance, would be more or less the same. The type of bed material beyond the breakwaters both at Malpe and Mangalore obtained at the instance of the Committee was found to be similar. The silting in the exposed approach channel due to wave action would therefore be roughly the same. The Committee also found that the exposed approach channel in the case of Malpe was slightly longer than the channel for Mangalore, thereby having the possibility of slightly more silting at Malpe due to wave action. In spite of this, however, the Committee felt that the overall maintenance dredging at Mangalore may perhaps be slightly more than at Malpe because of the proximity of the new Gurpur mouth on the north of Mangalore. The extra cost involved in maintenance dredging at Mangalore is, however, likely to be a small fraction of the over-all expenditure in maintaining a deep sea harbour at either of the two places and should therefore have little significance in the ultimate selection between Mangalore and Malpe.

Railway construction

7.22. The Southern Railway has furnished to the Committee the following information in respect of railway lines to both Mangalore and Malpe Ports:—

(a) The length of the proposed meter gauge section between Hassan and Mangalore is 122·6 miles, the cost of which is estimated to be Rs. 10·24 crores. In addition the improvement of the capacity of the existing lines and providing rolling stock etc. for handling 2·0 million tons of ore is roughly estimated at Rs. 7 to 8 crores.

(b) The traffic forecast on the Mangalore-Hassan line is as follows:—

First year	215,000 tons
6th year	287,000 tons
11th year	430,000 tons

This traffic estimate has been made assuming that the present conditions at Mangalore Port will continue. The traffic estimate also does not take into consideration the possible iron ore traffic.

(c) The distance of the Bhadravati-Malpe line will be 109 miles and this is estimated to cost Rs. 10 crores if the line is a meter gauge line. In calculating the costs Southern Railway has assumed the same gradient both for the Mangalore-Hassan and the Malpe-Bhadravati lines, *viz.*, rising gradient 1·100 from Hassan to Mangalore and 1·50 in the return direction.

7.23. The Southern Railway felt that the traffic prospects of the Malpe-Bhardavati line were poor, since after leaving Bhadravati there is no place of commercial or industrial importance till Malpe is reached. The Southern Railway therefore, favoured the Mangalore-Hassan railway line.

The reasons for preferring Mangalore as a deep-sea port in preference to Malpe

7.24. In spite of the advantages in initial capital cost in the construction of a port and railway link at Malpe, the Committee prefers Mangalore as the site of the future all-weather deep-sea port to serve the industrial hinterland of Mysore for the following reasons:—

(a) The initial advantage in the capital cost for the construction of a port at Malpe will be more than off-set by the need for the construction of a new town-ship at Malpe. Mangalore is already a well developed port town with facilities such as banking, electricity, water-supply, workshop and lighterage. It has also high traditions in seamanship, commerce and stevedoring.

(b) Mangalore has already a broad-gauge link and is more centrally situated on the coastline between Mormugao and Cochin than Malpe. The road connections serving Mangalore at present are also more numerous and better developed than those to Malpe.

(c) In Mangalore there is already an existing intermediate port with a trade of about 4·35 lakh tons per annum.

(d) From the point of view of the time required to construct a harbour, this would be much quicker in the case of Mangalore than at Malpe where in the absence of a railway and a working port, there would be the problem of importing the necessary building materials such as cement and steel and the requisite machinery for the construction of a harbour. Everything at Malpe will have to be started from scratch. At Mangalore, on the other hand, there is a well developed intermediate port with tugs, dredgers, and a marine workshop, adequate lighterage, and a broadgauge railway link. These will contribute materially to the speedy construction of a harbour at Mangalore.

(e) The Mangalore-Hassan line has, according to the Southern Railway better traffic prospects than the Malpe-Bhadravati line, recommended by the West Coast Major Ports Development Committee.

Engineering features

The harbour

7.25. Mangalore harbour is formed by the river Gurpur which runs in a southerly direction parallel to the coast and joins Netravati at its mouth. Gurpur river is separated from the sea by a narrow strip of firm ground about 2 miles long and a sand spit in continuation about 3 miles long having a width of 600 to 1000 ft. The present entrance to the harbour is through the common mouth of Netravati and Gurpur rivers. There is a bar at the entrance, the depth of which varies from about 7 to 9 ft. at L.W.O.S.T.

The Gurpur and Netravati rivers

7.26. The maximum observed discharge of the Netravati and Gurpur rivers are approximately 2,45,000 cusecs and 50,000 cusecs respectively. The slope of the Netravati river beyond the tidal limit is approximately 1·3 ft. per mile and that of Gurpur 0·7 ft. per mile. An analysis of silt samples from the two rivers has revealed that the average silt charge in the former is 0·3 parts per thousand and that of the latter 0·27 part per thousand. The Netravati river is estimated to carry 23 million cubic ft. of bed load per year as against 2·2 million cubic feet estimated for the Gurpur. The estimated suspended loads of the Netravati and Gurpur rivers are 67·5 million cubic feet and 12·2 million cubic feet per annum respectively.

Winds

7.27. The wind direction and speeds for different months of the year as obtained from the West Coast of India Pilot are shown below:—

WIND

0830

Percentage of observations from

	N.	*NE.*	*E.*	*SE.*	*S.*	*SW.*	*W.*
January	3	12	69	8	0	0	0
February	7	19	50	6	0	0	0
March	14	19	37	6	1	0	0
April	16	17	26	6	1	1	2
May	19	11	17	6	3	0	4
June	5	6	24	10	5	10	18
July	5	5	11	5	5	8	32
August	7	6	9	4	2	6	21
September	9	9	23	7	4	3	7
October	8	10	44	10	2	2	2
November	2	15	62	9	1	0	0
December	1	17	66	8	1	0	0
Means	8	12	36	7	2	3	7
Totals	..	..	..	..	..	..	..
No. of Years' Observations	..	20	..	..	..	..	..

DIRECTION

1730													Mean wind force or speed 0830 1730 knots	No. of days with wind of 34 knots or more
Percentage of observations from														
NW.	*Calm*	*N.*	*NE*	*E*	*SE*	*S*	*SW*	*W*	*NW*	*Calm*				
0	8	3	0	0	0	0	15	11	71	0	4	6	0	
1	17	4	0	0	0	0	7	14	75	0	3	7	0	
1	22	1	0	1	0	0	3	13	82	0	3	7	0	
	24	1	1	0	1	1	11	15	70	0	3	7	0	
17	21	4	1	0	1	3	7	11	73	0	3	7	0	
8	14	2	1	3	5	6	30	25	25	3	4	5	0·1	
16	15	0	2	0	1	3	39	29	22	4	5	5	0	
14	31	5	1	1	1	3	21	27	38	3	4	5	0	
9	29	6	1	0	3	1	15	17	55	2	3	5	0	
4	18	2	1	1	4	11	15	21	44	1	3	5	0	
1	10	6	2	1	3	8	13	13	49	5	3	5	0	
0	7	3	1	3	2	1	7	12	71	1	5	5	0	
7	18	3	1	1	2	3	15	17	56	2	4	6	..	
..	..	..	..	..	..	..	..	..	..	..	..		0·1	
..	..	..	..	..	..	..	..	..	..	..	5	5	10	

Tides

7.28. The tidal particulars in respect of Mangalore are as follows:—

Mean higher high water	+4·5 ft.	
Mean lower high water	+4·2 ft.	
Mean lower low water	+1·3 ft.	
Mean higher low water	*+2·5 ft.	near the solstices
Mean higher highwater	+4·9 ft.	at springs
Mean lower low water	+0·4 ft.	at springs

Cyclonic storms

7.29. Mangalore is within the cyclonic area. The storms that frequent the Arabian Sea may be divided into two groups:—

(i) Those that form in the sea itself; and

(ii) Those that enter it across the Indian Peninsula from the Bay of Bengal.

The number of occasions on which cyclonic storms in the sea have occured in each month from 1891 to 1937 is given in the following table:—

PERIOD												
Jan.	Feb	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
3	0	0	3	11	15	4	0	4	14	15	3	72

Though not so severe or as frequent as the cyclones in the Bay of Bengal, on occasions the storms in the Arabian Sea may attain great intensity. The description of a storm which occured between 10th and 13th November 1927 in the Arabian Sea near Lat. 12° N. and Long. 68°E., just south of Mangalore, as given by the India Meteorological Department is reproduced below:—

> "A depression formed in the Arabian Sea on the 10th November with centre near Lat. 12°N. and Long. 68°E. It slowly gathered strength and moved first northward then northeastward. It became a storm on the early morning of the 12th and developed into a severe one by 8 hours on the 12th with centre about 200 miles SW of Bombay near Lat. 17°N. and Long. 70°E. North easterly winds of storm force and rough seas prevailed off the Konkan-Kathiawar coasts in the northern semicircle. The storm crossed coast to the south of Bombay near Jaujira in the early morning of the 13th and rapidly weakened thereafter.
>
> The storm played havoc on coastal craft and fishing boats. It must have had a narraow core of hurricane winds and was one of the most disastrous storms that have struck the Konkan coast in recent times. Two coastal steamers s.s. "Sant Tukaram" and s.s. "Jayanti" which left Bombay for southern ports on the morning of the 12th foundered near Janjira, with a total loss of life of more then 200."

Waves

7.30. The predominent strike of the waves during the south-west monsoon period is from the west. This direction changes to north-west during the north-east monsoon period. According to the Poona Research Station, the mean wave height during the fair weather season in 1' 9" and the wave period is 17 seconds. During the south-west monsoon season the usual wave heights are from 5 to 6 ft. with a wave period of 3 to 6 seconds. The Committee however, considers that during storms waves as high as 20 ft. may be expected in the open sea.

Currents

7.31. During south-west monsoon the coastal current is from north to south. The velocity of the coastal current is maximum during this season the maximum velocity attained being of the order of 9 sea miles per day as against 3 miles per day during the fair weather season when the direction of the currents are reversed. The entire coastal water of the Arabian Sea during the south-west monsoon season moves in a clock-wise direction and joins the east going equitorial currents which extends for a few degrees to the north of the Equator.

7.32. Float observations carried out during the south-west monsoon season at Mangalore at the instance of the Committee indicate that during heavy floods the floats irrespective of their position of release into the estuary after entry into the sea, turn sharply southwards and travel along the coast-line. The floats were usually recovered generally in the region of the Someshwar Rock approximately 3 to 4 miles south of the river mouth. The maximum velocity attained by the floats especially at the gut was of the order of 6 to 7 knots.

7.33. Observations during the monsoon at Mangalore also indicated that the sea southward of the gut was reddish having the same colour as the river waters indicating that the entire discharge of the Gurpur and Netravati rivers during the monsoons along with its sediment load travels southwards. The sea to the north of the gut was, however, of greenish grey in colour. Though the littoral drift tends to form the spit from north to south the southern tip of the spit erodes when Netravati is in spate. Owing to its southward projection the spit normally marks a part of the waterway of the Netravati in the northern bank side. When the river Netravati is in spate its flow hits the tip and erodes it. This eroding action is aggravated by the southward curvature of the current when the river enters the sea. Under these conditions the centrifugal force increases the strength of the current and hence the eroding action in the north. When the floods subside the spit tends to reform and extend southwards.

7.34. Observations of current during the south-west monsoon at Cochin and Alleppey also showed the direction of flow from north to south.

Littoral sand drift

7.35. For the West Coast, the quantity of littoral drift is known to be small compared to that on the east coast. This can be established from a study of the shape and direction of entry of the various rivers, and the deposition and accretion on the north and south sides of rocky

promontories on this coast. Coastline at both kaph rock 24 miles in the north of Mangalore and Someshwar 3 miles on the south is convex in the north and concave in the south indicating balance of silting in the north and scouring on the south. Again study of promontories like Mount Delly, Cannanore Points and Kudalur Point shows curves to the south which have not silted. This clearly shows that the balance of silting is from the north and not from the south.

7.36. The Gurpur spit at Mangalore is from north to south and so also the spit at the north of Malpe river.

7.37. During the monsoons, spring tides cause a backing up of the freshet discharge brought down by the river and also a retradation of the movement of the bed sand outside the gut. In the fair weather season the discharge brought down by the river is practically negligible. The tidal flow is however, strong and the maximum tidal discharge at the gut for a spring tide range of 6 ft. has been calculated as 47,000 cusecs by the Poona Research Station. The maximum average velocity at the gut during such spring tides exceeds the critical velocity necessary for the movement of the sand particle on the sea bed, but such tides amount to only 1 per cent of the total number of tides in a year as analysed by the Research Station. Thus there does not appear a possibility of any large quantity of bed material being carried during the fair weather, except materials which may be thrown in suspension by wave action. This quantity also cannot be large as the wave action is not strong during this season.

Comparative study of hydrographic surveys carried out in 1900, 1913 and 1949.

7.38. The hydrographic surveys of Mangalore Port carried out in 1900, 1913 and 1949 are shown as inset in Drawing No. IPDC/14. The following features may be noted from a comparative study of these charts:

(a) **The coast line.**—The coast line on the north of the present gut has gradually been built up in a period of 49 years from 1900 to 1949 for a maximum distance of about 400 ft. just on the north of present gut and gradually tailing to zero in a distance of approximately 1½ sea miles northward from the centre line of the existing gut. This triangular beach formation roughly 12,000 ft. x 400 ft. base, has been formed during a period of 49 years. On the south side also during this period, the shore line has advanced by 400 ft. uniformly though the southern limit of this beach formation cannot be ascertained as the surveys extend to only about 6,000 ft. south of the present gut.

(b) **The Sea bed.**—The study of the 1913 and 1949 surveys indicates that the two fathom contour off the sand spit on the north of the gut has advanced closer to the shore slightly, the 3 fathom contour in a more marked manner and the 4 fathom contour less pronouncedly. The 1, 2, 3, 4 and 5 fathom contours have receded further into the sea at the mouth indicating clearly the areas in which deposition has occured. The northern limit of such deposition has been marked on the inset of Drawing No. IPDC/14. To the south of the gut, the area covered by the survey extends only to a

sea mile south of the present gut. In this region, a comparison of the 1913 and 1949 surveys indicate that all the contours have receded towards the sea. In the 1900 survey, however, the 3 fathom contour appears much farther out than the 1913 and 1949 surveys.

(c) **The direction of entry of the river.**—From each of the hydrographic charts of 1900, 1913 and 1949, the directions of the flow of the river into the sea has been ascertained by marking the existing channel of that year.

(d) **The quantity of silting.**—The quantity of silting that has occurred at the mouth of the sea off Mangalore was calculated from the surveys of 1913 and 1949. This quantity from the northern limit of silting to the southern limit of the survey was 135 million cubic feet in 36 years *i.e.* about 3·8 million c.f.t. or 0·2 million tons per year. Assuming the total sediment load of the two rivers as 105 million cubic feet per year as given in para 7.26, the percentage of silt which has been actually deposited from the northern limit of silting southwards to the boundary of the survey is only about 4 per cent.

Model studies

7.39. The Madras Government at the instance of the Mangalore Port Trust, arranged for certain model studies to be carried out in respect of Mangalore Port at the Poona Research Station to establish the feasibility or otherwise of constructing a deep-sea port at Mangalore, of which the West Coast Major Ports Development Committee was not very much optimistic without heavy capital commitments in the shape of breakwaters. The following terms of reference were made to the Poona Research Station by the Madras State Government :

Terms of reference

(i) Whether it is possible, by diverting the two rivers, Netravati and Gurpur and converting Magalore harbour into a tidal basin with an entrance channel out through the sand spit from the five fathom contour of soundings to an inner harbour, to maintain a dredged channel, dredged to minus 30 feet, which will not involve a heavy dredging programme.

(ii) If a heavy dredging programme is likely to occur, would artificial works such as groynes (*i.e.* breakwaters) reduce the dredging?

(iii) if so, where should the groynes be sited?

(iv) If it is found impracticable because of costs to maintain a dredged channel of minus 30 ft. would it be possible to maintain a channel dredged to minus 22 ft. which would not involve a heavy dredging programme, with or without artificial works?

(v) By directing the two rivers, Netravati and Gurpur, would this result in a heavy silting up of the tidal basin (inner harbour) dredged to (a) minus 30 feet or (b) minus 22 feet provided the entrance channel could be maintained? Would protective works be necessary for the inner harbour?

(vi) If the site of the proposed channel through the sandspit is found impracticable, would it be possible to maintain a channel through the present entrance and bar dredged to (a) minus 30 ft. (b) minus 22 ft. (c) minus 15 ft.?

(vii) If so, would artificial works such as groynes be necessary to reduce the dredging?

(viii) Could the model indicate the best alignment for the dredged channel?

(ix) If it is found possible to maintain a channel through the present entrance and bar, could the model indicate the most favourable position to site the inner harbour either in the Netravati basin or in the Gurpur basin?

(x) If both the sites for entrance channel outlined in (i) and (vi) above prove unsatisfactory, could the model indicate the best possible site for maintaining a channel of (a) minus 30 ft. (b) minus 22 feet?

(xi) If it is found possible to maintain a channel through the present entrance as outlined in (vi) above, would it be detrimental to the port to (a) divert the river Gurpur through the sand-spit at Sultan's Battery or (b) construct a spillway further north at Thannirbhave to carry off flood water during south-west monsoon to prevent inundation of 20,000 acres of rich paddy lands?

Results of experiments as forwarded by the Research Station

7.40. The results of the model experiments carried out on the development, of Mangalore Port are made available by the Research Station in 4 specific notes as follows:—

(a) Specific Note No. 321, dated 5th December, 1954 dealing with the Mangalore Port model and its proving and marine and hydraulic features encountered in the proto-type.

(b) Specific Note No. 374, dated 17th December, 1955, describing the experiments carried out with dredging a channel through the existing gut and developing the harbour either in the Netravati or Gurpur rivers with or without diverting the Gurpur river, the approach channel being dredged to 30, 22 and 15 feet below L.W.O.S.T.

(c) Specific Note No. 388, dated 20th April, describing the experiments carried out with an approach channel through the sand-spit, Netravati river diverted and with and without the diversion of the Gurpur river the approach channel being dredged to the same depths as above.

(d) Specific Note No. 395, dated 2nd June 1956, describing experiments carried out to determine the suitability of the component breakwater materials during the process of construction and after completion of the composite breakwater section.

Specific Note No. 374, dated 17-12-1955.

7.41. As stated above this Specific Note deals with experiments carried out with (i) dredging a channel through the gut and developing the harbour basin either in the Netravati or Gurpur rivers with or without diverting Gurpur river; the approach channel being dredged to 30, 22 and 15 ft. below L.W.O.S.T. and (ii) dredging a channel through the north sand-spit and harbour basin developed in the Gurpur river, with or without diverting the Gurpur river the approach channel being dredged to the same depths as for (i).

(1) The following conclusions were arrived at: "Experiments have shown that it would not be possible to economically maintain a channel which would admit ships drawing 30 ft. as the channel gets silted up considerably during the monsoon. The dredging of this channel would not be possible immediately after the monsoon owing to inclement weather conditions. Naturally ships cannot be admitted till the channel is dredged in January or February when there are calm spells in the sea *i.e.* weather conditions are favourable.

(2) The approach channel for admitting ships drawing 22 ft. had shown promising results. This 22 ft. draft would be available throughout the year when the channel is initially dredged to 29.5 ft. allowing for squatting of ships, swell and silting.

(3) As the sediment load brought down by the Netravati River is much more than that of the Gurpur River, it would be economical to locate the inner harbour basin in the Gurpur River along the left bank, where rail road facilities already exist. This is also the existing trade centre. The help of tugs would be required for manoeuvring the ships coming in and going out of the harbour.

(4) The conditions in the approach channel deteriorate when Gurpur River is diverted upstream. It was found advantageous to have both rivers flowing through the gut from the point of view of maintaining better depths in the approach channel.

(5) The future development of the port can be done on the right bank of the Gurpur by making use of the northern sand-spit for the location of warehouses, transit sheds, etc. This would, however, necessitate a bridge across the Gurpur for providing rail and road communications.

(6) An approach channel admitting ships drawing 15 ft. would be self-maintained. Very negligible quantity of dredging, if any, would be required for the maintenance of such a channel. Such a channel may have to be initially dredged to 18.5 ft.

(7) It would not be possible to get the required depths either in 22 ft. or 15 ft. channel proposals without breakwater. The optimum length of the breakwaters for 22 ft. channel and 15 ft. channel are 2000 ft. and 1000 ft. respectively.

(8) Sand-trap across the Netravati river would be necessary to trap part of the bed load of the Netravati to reduce silting in the portion of the basin opposite the gut."

Specific Note No. 388, *dated* 20-4-1956

7.42. As already stated this Specific Note describes the experiment carried out with the approach channel in the sand-spit, Netravati river diverted and with and without diversion of the Gurpur river for a channel depth of 30 ft., 22 ft. and 15 ft. below L.W.O.S.T.

The following conclusions were arrived at:

(a) *Experiments with* 30 *ft. approach channel*:

(i) When the channel is dredged to a depth of 36 ft., silting occurred to the extent of 16 ft. in the portion outside the breakwaters meaning thereby that a depth of only 20 ft. would be available for navigation. The silting occured mostly by sand brought in by wave action. In this experiment two 4,000 ft. breakwaters were used.

(ii) While comparing this proposal with the previous proposal having approach channel through the existing gut it is noted that there is nothing to choose between the two proposals except that the present proposal may be slightly worse as it may not be possible to dredge material outside the breakwater.

(iii) Since due to wave action dredging is not possible outside the breakwaters for more than 9 months of the year and especially during and immediately after the monsoons, it would not be possible to maintain 30 ft. deep channel throughout the year.

(b) *Experiments with* 22 *ft. approach channel.*—This proposal was tested with a breakwater length of 2,000 ft. and was not considered satisfactory due to silting and considerable disturbances which occured in the inner harbour owing to swell.

(c) *Experiments with* 15 *ft. approach channel.*—Experiments were carried out with 100 ft. long breakwaters. It was noted that there was a tendency for the formation of a bar at the entrance. This proposal did not compare favourably with the corresponding proposal with the approach channel through the existing gut as with the latter proposal no silting was observed.

Specific Note No. 395, *dated 2nd June*, 1956.

7.43. These experiments were carried out with a view to determine the suitability of the component breakwater material during construction and after completion and certain detailed recommendations were made.

7.44. On study of the experiments conducted it was felt in the Ministry of Transport, that additional experiments were necessary for legoon type harbour with modified alignments of breakwaters to reduce the silting and height of waves inside the harbour and the Poona Research Station was requested to perform fresh experiments with alternate alignments for the breakwaters. This proposal made provision for sand traps outside the breakwaters to take care of silting that might accumulate due to littoral drift from any direction and for spending beaches and wave trap inside the harbour. These experiments were conducted and the results recorded in a specific note 442.

Further model studies.

7.45. The results of the tests indicated the following wave heights in the lagoon harbour when 10 ft. high waves were generated in the deep water from west south-west direction.

(i) In the unprotected part of the approach channel.		9 to 10 ft.
(ii) In the part of the approach channel protected by breakwaters	..	5 to 6 ft.
(iii) At the entrance to the basin	..	2 to 3 ft.
(iv) In the turning basin	..	1 to 2 ft.

The Research Station carried out silting experiments with silt of Netravati and littoral drift moving from south to north in south-west monsoon conditions and found that with the southern breakwater terminating at 22·0 ft. below datum the approach channel would silt to the extent of about 10 to 12 ft. just outside the breakwaters and gradually reducing to 1 ft. on the western end of the approach. The Director of the Research Station added that in his opinion the exposed part of the approach channel will get silted up within a short time due to wave action moving the bed material into the channel.

7.46. As the effect of wave action would vary with the nature of bed material a number of bore holes were sunk along the line of the proposed channel. The position of the bore holes and the nature of strata met with, are shown in Drawing No. IPDC/15. Wash boring samples were obtained and got tested in the laboratories of the Indian Institute of Science, Bangalore. These tests showed that the samples were not really undisturbed and that some of them had to be remoulded. Tests with these samples showed that except for the surface mud the cohesive strength of the soil varied between 200 and 250 lbs. per sq. ft. As will be seen from the plan showing the bore results the sea bed along the channel alignment consists of a shallow layer of mud underlain by soft clay or sand mixed with clay.

Coastal harbour.

7.47. The Director of the Research Station subsequently suggested that the best answer in his opinion for a port at Mangalore, would be a coastal harbour approximately 3 miles south of the Netravati mouth. The harbour envisaged by him, will be entirely protected by breakwater on all sides as in the case of the Madras harbour. The advantage claimed for this project was that the Netravati silt would not enter the coastal harbour above 3 miles on the south while it would enter the lagoon port about 3 miles on the north of the Netravati estuary, since he felt that the sediment load of the two rivers travelled northwards during the S.W. monsoon.

Selection of a site at Mangalore.

7.48. Before reproducting movement of silt in south-west mansoon from south to north and suggesting the coastal harbour on the south, the Research Station had made no field observations of the direction of the littoral current and actual movement of silt. These observations were made at the instance of the Committee in 1959 monsoon and the observations showed that coastal current moves from north to south in the south-west monsoon and that the entire discharge of Netravati moves in a southerly direction *vide* para. 7.32.

7.49. The Technical Sub-Committee of the Committee consisting of the Chairman, Capt. Piggot, Shri Srinivasan and Shri I. G. Chacko, Member Secretary examined all the data available and came to the following conclusions:

(i) In south-west monsoon the coastal current, the littoral drift and Netravati's silt moved from north to south and that the silting of the lagoon harbour approach would be very much less than of the coastal harbour to the south of the Netravati. It is only in this respect that the Sub-Committee differs with the Poona Research Station's views.

(ii) With the southern breakwater of the lagoon harbour extended to 26 ft. depth contours and 1:2 side slopes for the approach channel, the latter would be stable and that the maintenance dredging for a 30 ft. draft port would be small. As regards greater drafts the Sub-Committee opined that 34 ft. draft may require appreciable maintenance dredging and that 38 ft. draft may require still more. The Sub-Committee also came to the conclusion that in respect of the nature of sea bed in the approach channel the conditions at both Malpe and Mangalore were similar. Before coming to these conclusions the Sub-Committee got pipes driven in the sea-bed upto 7 fathom contours, with the help of the State Port Officer at both Mangalore and Malpe. The bed samples brought out by the pipes and the magnitude of penetration of the pipes under their own weighs and that of a man balanced on the top were examined by the Sub-Committee and thus the conclusions arrived at.

(iii) The Sub-Committee agreed with the Research Station that the estuary harbour was not suitable for deep draft ships.

(iv) The lagoon harbour was more protected than the coastal harbour and had greater scope for future expansion as the sheltered lagoon was about five miles long. Adequate land can be created in the spit by reclamation, utilising the material dredged from the approach channel and the turning basin to provide space for all port facilities. Later on when the port expanded, further land could be reclaimed on the town side as the lagoon was much wider than required for berthing and movement of ships.

(v) The lagoon harbour has also the advantage of being near the town of Mangalore and of being more convenient to tile factories which are located in the banks of the lagoon and the Gurpur and Netravati rivers. With suitable locks at the two ends of the lagoon the tiles can be brought from the factories almost all of which have water frontage from the factories to the port by water transport.

(vi) With the lagoon harbour the existing port facilities viz. lighterage wharves, dry dock, transit sheds and warehouse would continue to be utilised while with the coastal harbour all new facilities will have to be provided.

(vii) As regards industrial development there is adequate space to the north of Mangalore and this had a water front of about 1¼ miles.

Considering all these factors the Sub-Committee recommended the lagoon as the best port site near Mangalore, and this was accepted by the Committee.

Development of Mangalore into an all-weather deep draft port with alongside facilities.

7.50. In view of the need for exporting two million tons of iron ore annually through Mangalore as stated in Chapter II, the Committee considers that Mangalore should be developed as an all-weather port for at least 34 ft. draft ships in the next 5 to 10 years and if possible for 38 ft. draft ships as a long term measure. The project may be executed in two phases i.e. for 34 ft. draft and 38 ft. draft. The foundations for one berth should be made for 38 ft. draft and for general cargo berths for 32 ft. draft right in the first instance. In view of the uncertainty of the magnitude of capital and maintenance dredging required for 34 and 38 ft. drafts the Committee recommends that fresh undisturbed soil samples be obtained from sea bed to 48 ft. depth below L.W.O.S.T. from 4 fathom to 7 fathom contours and the soil samples analysed for their stability, cohesion and grain size etc. for deeper channels. This study will also help in deciding upon the type of the dredger to be obtained. The project for an all-weather port may be proceeded with only if these studies show that the approach outside the breakwaters will be stable for at least 34 ft. draft.

PORT DEVELOPMENT

Development of Mangalore into an all-weather port with alongside facilities for 34 ft. steamers.

7.51. The first phase development for 34 ft. draft all-weather port at Mangalore is shown in Drawing No. IPDC/14 and Drawing No. IPDC/15. A detailed lay out of the Approach channel, breakwaters, turning basin and berths is given in Drawing No. IPDC/16. In essence the scheme consists of the diversion of the Gurpur and Netravati rivers by constructing two bunds at the locations shown in Drawing No. IPDC/15. Two small locks will be provided in the bunds to admit I.W.T. craft into the lagoon from the Netravati and Gurpur rivers. A direct approach channel 500 ft. in width with a bed level of 38 ft. below L.W.O.S.T. will be dredged across the sand spit to connect the lagoon with the sea. The centre line of this approach channel will be roughly 3 miles north of the Netravatigut so as to be well outside the silting region at the mouth of the Netravati and Gurpur rivers. This approach channel will be protected by two curved breakwaters, the southern one extending upto the 26 ft. contour and the northern one to the 22 ft. contour. The southern breakwater will have a second arm as shown in Drawing No. IPDC/16. The breakwaters are designed for 20 ft. waves which may on occasions be expected at Mangalore. The cross-sections of the breakwaters as evolved by the Committee are given in Drawing No. IPDC/16. The width of the approach channel in the protected stretch within the breakwaters will be 400 ft. with a bed level of 37 ft. below L.W.O.S.T. The approach channel will terminate in a turning basin 1400 ft. square with a bed level of 32 ft. below L.W.O.S.T. to give a clearance of 2 ft. below keel. The berths taking off from the turning basin will be arranged in a grid pattern and so oriented that they point roughly to the prevailing winds blowing from south-west to west. In the first stage of harbour development, the Committee visualises the construction of 3 alongside

berths, 2 for general cargo and 1 for iron ore. This iron ore berth will be designed for an ultimate draft of 38 ft. and the remaining 3 for an ultimate draft of 32 ft. The iron ore berth will be fully mechanised. Each general cargo berth will be provided with three 3 ton and one 5 ton electric portal cranes. This will also release the second ore berth for general cargo. The sand spit itself will be reclaimed to a level of + 12 and widened to 1200 ft. The sand spit will be protected for about 2,000 ft. to the south of the south breakwater by longitudinal and cross stone groynes. In addition the entire southern spit upto the Netravati mouth will be protected by a stone pitched 50 ft. wide bund with its top at 8.00 to prevent high waves from overtopping and damaging the spit. The port when completed will have both metre gauge and broad gauge connections. The connection to the port marshalling yards and sidings will be taken from a point near the existing railway station at Mangalore. The lines will cross the Gurpur estuary over the bund constructed for the diversion of the river. The mashalling yard for the port will be located on the spit as shown in Drawing No. IPDC/14 and Drawing No. IPDC/15. The road approaches to the port will also be taken across the Gurpur estuary over the Netravati bund and will run parallel to the railway lines.

7.52. With regard to maintenance dredging, the Committee feels that a part of the Gurpur sediments may possibly be deposited in the approaches to the lagoon port as the river will be diverted to the sea roughly 1½ miles north of the proposed approach channel and the set of the currents in the sea during the south-west monsoon period is towards the south. As the quantum of Gurpur bed silt is itself small being of the order of only 0.1 million tons a year as calculated by the Poona Research Station and as it will have 1½ miles to travel before reaching the port, the quantum of silting expected on this score is very small.

7.53. The cost of an-weather harbour for 34 ft. steamers at Mangalore with 3 alongside berths, one for ore fully mechanised and two for general cargo, is estimated to be roughly Rs. 12·70 crores as per details given in Appendix XXIII.

Normal development at Mangalore.

7·54. Pending the decision of the Government of India, regarding Mangalore's future as an all-weather port with alongside facilities, the Committee felt that certain normal development works are necessary even if Mangalore has to continue as a lighterage port for a few years and that these should be undertaken immediately. These facilities now being proposed, will not be wasted even if an all-weather port is developed at Mangalore. These works which may be given first priority are: the provision of a new light house; the extension of the port workshop facilities; the construction of a new timber and firewood wharf at Khadathapalli including reclamation; the extension of the north lighterage wharf for iron ore; beach protection and wind screen with casurina plantation on the sand spit in 100 ft. wide belt for a length of 1 mile, the plantation being so sited that the visibility of the existing light house is not impaired; the provision of a 300 H.P. tug, a 100 H.P. launch and one 2-ton mobile crane; the replacement of the channel marking buoys with lighted buoys so that navigation by lighters at night is safe; and

further investigations for development of Mangalore into an all-weather port. The cost of these works is estimated to be Rs. 28·00 lakhs as per details given in Appendix X.

Economics of a deep-sea harbour at Mangalore.

7.55. The economics of developing an all-weather Port at Mangalore for 34 ft. draft steamers with 3 alongside berths, two for general cargo and one for ore fully mechanised, capable of handling 2·6 million tons of cargo per annum including 2 million tons of iron ore, are shown in Appendix XXIV A. It will be seen therefrom that the port will make a net profit of about Rs. 43 lakhs a year after allowing for interest and depreciation. These calculations assume that maintenance dredging will be about one million tons a year. This assumption has to be verified after soil studies. The Committee, therefore, recommends the development of Mangalore as an all-weather along-side port for 34 ft. draft.

The Port of Karwar

General.

7.56. The Port of Karwar is located on the southern end of Karwar Bay in the shelter of Karwar headland approximately 50 miles south of Marmogao. It is one of the important intermediate ports of Mysore State and is well situated for the export of high grade iron ore from the Bellary-Hospet region.

7.57. Karwar Bay is a bight between Karwar head and the mouth of the Kalinadi river, 2¾ miles distant. Karwar head, a rocky promontory stretching out into the sea, gives a measure of protection to the bay during the south-west monsoon period. Several rocks and islands in the approaches to the harbour give added safety to the vessels from swell. The range of tides in the day is 5 ft. at springs and 2 ft. at neaps.

7.58. Baitkal Cove is a small cove formed well inside Karwar bay in the shelter of Karwar headland and the mainland. The existing port facilities are located in this cove. A list of the port facilities at Karwar is given in Appendix VII. These facilities are also shown in Drawing No. IPDC/17.

Traffic pattern.

7.59. Karwar Port is at present handling an annual import and export of 1,58,000 tons of cargo. The volume of traffic handled at the Port of Karwar from 1950-51 to 1959-60 and the number and nett registered tonnage of steamers and sailing vessels which visited the port during this period, are given in Appendix VIII and IX of this report.

7.60. The main traffic at Karwar at present is the export of iron ore. The rich deposits of iron ore situated in the Bellary-Hospet-Sandur region are closest to Karwar Port. The estimated proved deposits in this region are of the order of 200 million tons, with possible reserves of 400 million tons. The iron content of this ore varies from 60 to 68 per cent. The movement of iron ore to the port is effected by a rail-cum-road route. The ore from the Bellary-Hospet region is brought by rail to Hubli, a distance of 89 miles from Hospet to Hubli or 130 miles from Bellary to Hubli, transhipped at Hubli and then transported by road

for a distance of 104 miles to Karwar Port in trucks. The main bottlenecks for the movement of ore to Karwar Port are firstly the limitation of capacity of the metre gauge–railway from Bellary and Hospet to Hubli which can at present handle only 2 metre gauge rakes per day. This limits the movement of iron ore to the port by rail to about 1000 tons per day. The second limitation is the inadequate roads and bridges from Hubli to Karwar Port. The road is narrow in parts hardly sufficient for two-way traffic and passes through the Western Ghats with steep gradients. The bridges and culverts are not designed for the heavier type of road transport vehicles which will have to be used for economy in the transport of iron ore by road. The Committee therefore, felt that the first step in the development of Karwar Port should be the improvement of the transport links to the port. The existing 12 ft. carriarge-way should be widened to 22 ft. i.e. 2 lane carriageway capable of standing heavy vehicles. The formation should also be widened to 38 ft. The bridges and culverts on this road should be strengthened to carry Indian Road Congress AA class vehicles. The Railway Board should also take suitable measures to increase the capacity of the railway line from Bellary-Hospet area to Hubli from 2 rakes of iron ore to 4 rakes per day immediately.

7.61. The present cost of transport of iron ore from the Hospet mines to F.O.B.T. Karwar is Rs. 40.81 per ton including transhipment charges as per break up given in Appendix XXV which was supplied by the State Government. By effecting improvement to the transport links to the port it will be possible not only to reduce the F.O.B. price at Karwar, but also to increase the quantity of iron ore exports through Karwar Port.

7.62. There is also the possibility of exporting manganese ore through Karwar. Excellent deposits of manganese ore with an extremely low phosphorous content occur in the Supa-Daudeli area in an approximately 30 mile long north-west south-east belt between Karwar and Dharwar. The reserves have been estimated to be 2 to 3 million tons. The mines in this region are roughly 40 to 80 miles by road to Karwar. A direct road 70 miles in length from Londa to Karwar Port with a bridge across the Kalinadi river will provide a direct link to the manganese ore mines from Karwar Port. This is recommended in preference to the Londa-Sadashivgarh road comtemplated at present.

7.63. It will also be possible for Karwar Port to develop a small quantity of general cargo, generated or required within a radius of 100 miles from the port including Hubli town. Such cargo may consist of the imports of kerosene oil, sugar, textile goods, salt and the export of groundnut oil and oil cakes.

Future Traffic.

7.64. The State Trading Corporation visualises the export of 5 lakh tons of iron ore per annum through Karwar in the next few years. In addition during this period there is a possibility of developing a manganese ore export trade of the order of a lakh tons and a general cargo traffic both imports and exports of 50,000 tons per annum at Karwar. The Committee therefore is of the opinion that a traffic of 6 to 7 lakh tons per annum at Karwar can reasonably be expected in the next 10 years provided the transport links to the ports are developed as suggested in this report.

Engineering features.

7.65. Probings undertaken by the State Government at the request of the Committee, indicate that it will be possible to dredge an approach channel and turning basin in this bay and one berth 600 ft. in length in Baitkol Cove, without encountering rock for 30 to 32 ft. draft vessels. Wave observations were also undertaken in August last year during the south-west monsoon period by the State Government at the request of the Committee. These indicate that at a site on the north of Baitkol Cove which is suitable for a turning basin for ships, wave heights of 3 ft. could be expected, though generally the height does not exceed 2 ft. It therefore, appeared to the Committee that it would be feasible to construct one alongside berth for 30 to 32 ft. draft steamers at Karwar at a comparatively cheap cost without either encountering rock, the dredging of which will be a costly proposition or the construction of long breakwaters to degrade the swell and waves of the monsoons.

7.66. The site, however, suffers from one disadvantage. The river Kalinadi which rises in the Goa frontier, debouches into the Karwar Bay after a course of about 90 miles. Considerable quantities of silt are brought down by the river into the bay. Float observations and a field study carried out in the bay during the south-west monsoon season by the State Government at the instance of the Committee, indicate that the monsoon freshets with their sediment load travel southwards across any possible approach channel for deep draft steamers which may be dredged from the sea to the shelter of Baitkal Cove. There is also a tendency for the freshets to circulate in Karwar Bay in an anti-clock wise direction, thus bringing part of the silt back into the bay and Baitkal Cove itself. A study of the hydrographic surveys of the bay carried out in 1880 and 1955 indicate considerable silting in the bay. The 3 and 4 and 5 fathom contours have advanced by 2400 ft., 3,000 ft. and 2700 ft. respectively in a period of 75 years. Drawing No. IPDC/17 attached to this report gives the plan of Karwar harbour and Baitkal Cove. The results of rock probings on the site of a possible approach channel, turning basin and a single berth as well as comparative sea bed contours from the two hydrographic surveys of 1880 and 1955, superimposed on each other, are also shown in this drawing.

Port development.

7.67. The Port development at Karwar may conveniently be taken up in stages. The first stage which should be taken up immediately visualises the development of Karwar into an efficient fair weather lighterage port capable of handling about 5 lakh tons of iron ore, one lakh ton of manganese ore and 50,000 tons of general cargo. The facilities which are necessary during the first stage are: a fully equipped lighterage wharf, 1000 ft. in length, located in Baitkal Cove in such a manner as to suit the future pattern of an all-weather port: the provision of repair facilities for port craft; and the provision of a pilot launch. These works, estimated to cost Rs. 25 lakhs as per details given in Appendix X. may be given first priority. Certain other works which are also necessary but can be given second priority are given below. There are: the improvement to night navigational aids; acquisition of a tug for harbour service, towage of passenger boats and sailing craft and harbour inspection purposes, and 2 mooring bouys; construction of essential quarters for staff and the extension of the present small office building; provision of

a water barge for supply of water to ships with the necessary arrangements for water supply; and the construction of a transit shed for general cargo. The approximate cost for this development is Rs. 9·5 lakhs as per items (i) to (vii) under second priority for Karwar given in Appendix X. The layout for port development recommended by the Committee, is given in Drawing No. IPDC/18 attached to this report.

7.68. The question of water supply at Karwar Port is important. A study of the water resources in this region for port purposes should immediately be undertaken by the State Government. The daily requirement of treated water will be of the order of 200 tons. The storage capacity should be at least 500 tons.

7.69. In view of the importance of Karwar as a passenger port for passengers going to and from Goa, improvement to the shore facilities for passengers, such as adequate passenger sheds, rest rooms, canteen and lavatories, are also recommended.

7.70. The proposed development works in Baitkal Cove should be fully co-ordinated with the fishing harbour proposed to be located in the same Cove. The lay-out recommended by the Committee takes this into consideration.

7.71. The second stage of development visualises an all-weather one berth port at Karwar, provided dredging experiments, to be carried out, prove that maintenance dredging required is not excessive and can be handled by the minor port pool dredgers and that this does not require a full time dredger for the purpose. This scheme will involve the dredging of an approach channel from the sea terminating in a turning basin immediately to the north of Baitkal Cove in the shelter of Karwar Head as shown in Drawing No. IPDC/17 attached to this report. An all-weather mooring for steamers drawing from 30 to 32 ft. will be provided in Baitkal Cove itself. This stage may be followed up by the provision of one alongside berth 600 ft. in length instead of the mooring. Any additional berths, however, will entail rock dredging and/or costly breakwaters. The approximate cost of a project for providing one alongside berth is Rs. 1,52,00,000 out of which the cost of the alongside berth is estimated at Rs. 30.4 lakhs. The details of this estimate may be seen *at* Appendix X *vide* items VIII to XVIII under Karwar. The Committee is unable to determine the magnitude of silting that might occur yearly in the approach channel, the turning basin and the berth at Karwar without protective works. The Committee, therefore, recommends that before the second phase work is taken in hand, trial dredging should be carried out to determine the magnitude of silting per annum that might be expected at Karwar without protective works. The Committee recommends this work being given second priority if the dredging experiments show that the maintenance dredging required is not likely to be excessive.

7.72. The need for the second phase programme will arise only after the dredging experiments show that maintenance dredging will not be excessive, after the railways arrange to bring four rakes of iron ore to Hubli daily, after the road from Hubli to Karwar is improved as recommended above to enable it to carry 5,00,000 tons of iron ore a year and after there are clear indications that the port will be called upon to handle traffic exceeding 5,00,000 tons a year.

7.73. The port at present suffers from lack of space. It is, therefore, highly desirable that the port should acquire some 150 acres of land adjacent to the port at a very early date. This land will be a valuable asset to the port in the event of the port being developed further in the future. Non acquisition of this land now may make it both costly and difficult to acquire later as the land may get built upon. The cost of this land is estimated at Rs. 20 lakhs and this is included in the cost of the project for providing one alongside berth.

Chapter VIII

BOMBAY STATE

(Maharashtra region)

Introduction

8.1. The region of Maharashtra has a coast line roughly 320 miles in length facing the Arabian Sea. The territory south of Bombay City, known as Konkan, consists of the undulating table lands of the Deccan Plateau with the high ranges of the Western Ghats on its western end. The coast line is generally fringed with cliffs alternating with reaches of sand and denuded headlands and bays hollowed out by the waves. On this stretch of the coast are located the intermediate port of Ratnagiri and innumerable minor ports. The Western Ghats act as a barrier against easy communication with the hinterland of the ports. Due to the difficult nature of the terrain none of the ports in this region are connected by rail. Road connection to the coastal towns and ports are being gradually developed.

8.2. The present known minerals of the region consist of iron ore, bauxite, glass sand, mica, manganese, chromite and building stone. Out of this, the glass sand from the Vengurla region finds an outlet as coastal traffic through the ports in this region. Iron ore from the Redi area is being exported to foreign countries. In view of the importance of Redi Port in the future from the point of view of iron ore exports, the Committee decided to visit Redi Port which at present is clasified only as a minor port.

8.3. The region is essentially an agricultural region. The main produces are paddy, mangoes, cashew nuts, betel nuts and coconuts. Out of these mangoes are exported through the minor and intermediate ports of the region to Bombay. There are no industries of note in the coastal belt south of Bombay and Poona which can be served by the ports in the Konkan region.

8.4. The state of Bombay has a minor ports organisation headed by a Principal Port Officer and Engineer. The engineering works relating to the ports in the Konkan region are looked after by an Executive Engineer in charge of a Marine Division.

The Port of Redi

General

8.5. The present port of Redi from where the export of iron ore is being carried out is located immediately south of Rairy Point in the shelter formed by a rocky projection. It is roughly 7 miles south of the port of Vengurla and 2½ miles to the north of the Goa border. There is an old port of Redi which is located in a creek north eastward of Rairy Point. This port has been closed since 1952. From 1954 the new port of Redi has come into prominence due to the export of iron ore to foreign

countries. Outcrops of "Limonite-haematite", a variety of iron ore appear on the coast just south of Rairy Point within a radius of four miles from the new port. A few firms have been given mining rights by the Bombay State Government for the exploitation of this iron ore for export. Two of these firms have built their own jetties for handling the iron ore into lighters. They have also provided the necessary lighters and tugs and have marked the navigation channel for these vessels with improvised bouys. The existing port facilities are listed in Appendix VII and shown in Drawing No. IPDC/19, attached to this report.

Traffic pattern

8.6. Iron ore deposits have been found between Vengurla in the north and Redi in the south in a belt extending upto 16 miles from the coast. The quality of the iron ore in this belt is low grade but some deposits are richer than others. At Redi the iron ore is richer in iron content, the lowest limit being 58 to 60 per cent. The estimated reserves in this region is about 50 to 60 million tons.

8.7. Redi is now entirely an iron ore port, this being the main traffic. The port commenced the export of iron ore from February 1955. The total traffic handled at Redi in 1958-59 was 1,40,808 tons. The volume of traffic handled at Redi from 1955-56 to 1959-60 and the number and nett registered tonnage of steamers and sailing craft which visited the port during this period are given in Appendices. VIII and IX.

8.8. The mines now being worked are adjacent to the port within a radius of four miles, one mine being at the port itself. The ore is transported in trucks, stored at the port and then shipped using lighters. The port is closed to traffic during the south-west monsoon period.

Future traffic

8.9. The State Trading Corporation has communicated to the Committee that during the next 10 years they propose to export half a million tons of iron ore per annum through Redi Port.

Engineering features

8.10. The coast from Rio Terekhol, the boundary between Goa and the Indian Union, trends in a northeasterly direction for about $2\frac{1}{4}$ miles to Rairy Point. Rairy Point is a rocky projection into the sea, the western tip of which being 50 ft. in height. Foul ground with outcrops of rock extends about $\frac{3}{4}$ of a mile south-westward and $\frac{1}{2}$ a mile westward of this point.

8.11. The small cove south of Rairy Point where one jetty built by the mining companies is located, is 10 to 12 ft. in depth at L.W.O.S.T. Several outcrops of rock occur on either side of the Bay. The second jetty built by the mining companies is located on the north-side of Rairy Point and is exposed to the north-west swell of the fair weather period.

8.12. The littoral currents off Redi in the Arabian Sea is generally to north from November to January and have a strength upto one knot. By February the current changes towards south and remains in that direction upto about October. Stronger currents are experienced in this season which attains strengths upto 2 knots. The prevailing winds are south-westerlies, westerlies and north-westerlies. Average winds in July

attain a force of 4 in the Beaufort Scale. A wind rose based on the winds at Goa is given in Drawing No. IPDC/19. The sea at Redi is tidal, the average range at springs being 6 ft. and that at neaps about 2 ft.

Port development

8.13. In view of the importance of Redi Port for the export of iron ore, the Committee considers that Redi Port should be developed as an intermediate port for handling 5 lakh tons of iron ore per annum.

8.14. The Committee recommends that the State Government should take over Redi Port and provide an additional 400 ft. length of wharf wall and navigational aids together with ancillary works as per details given in Appendix X. The proposed development is shown in Drawing No. IPDC/19. The costs of these works estimated at Rs. 10 lakhs should in the Committee's view be given a high priority.

THE PORT OF RATNAGIRI

General

8.15. The Port of Ratnagiri is located on the Arabian Sea in Ratnagiri Bay on the northern side of the mouth of the Ratnagiri or Rajivada Creek, as it is otherwise known. The port is about 120 miles south of Bombay coastwise and is an important terminal for coastal passenger traffic from Bombay. Due to its importance as a passenger port, Ratnagiri is classified as an intermediate port. The list of port facilities that are available at Ratnagiri is given in Appendix VIII attached to this report.

Traffic pattern

8.16. The Bombay-Vengurla steamer service operated by the Bombay Steam (1953) Ltd., during the fair weather season from September to May, touches Ratnagiri daily both during the outward and inward runs. The steamers operating on this run have a length overall of 220 ft. and a loaded draft of about 9 ft. These ships are designed to operate only during the fair weather season and carry roughly 900 passengers mostly on deck. The outward steamer leaves Bombay daily (except Tuesday) in the morning at 10·00 hours and reaches Vengurla the following morning 8·00 hours and *en route* touches Ratnagiri at about 22 hours. The inward steamer leaves Vengurla in the morning at 10·00 hours and reaches Bombay the following morning at 8.00 hours touching Ratnagiri *en route* at about 20.00 hours. The steamers thus performs a round trip between Bombay and Vengurla in about 46 hours. Due to the nature of the terrain between Poona and Ratnagiri, which is rough and mountainous, the lines of communication, both roads and railways, are poorly developed. A large number of people from Ratnagiri and adjoining areas who make a livelihood in the city of Bombay, therefore find it convenient to use the steamer route, as this affords a cheaper and more convenient mode of transport than that offered by road or by rail. The steamers anchor in Ratnagiri Bay in the shelter of Pinnacle Peak where the Ratnagiri lighthouse is located. The passengers are embarked and disembarked using dumb sea-worthy 'Khapadas' maintained by the steamship company. They are landed on the pier in Ratnagiri Bay. This pier is unworkable both at high and low tides due, in the former case to the water over-topping the pier at high tide, and in the later case due to the fact that there is no water at the pier at low tide. The passengers are therefore, put to great inconvenience. From 1950-51 to 1954-55, there

has been a steady passenger traffic of the order of 1·3 lakh persons per annum. Since 1954-55 however, with the improvement of roads and the development of road transport being undertaken in the Second Five Year Plan, the passenger traffic steadily reduced to 1,00,000 by 1958-59. Apart from the passenger traffic, Ratnagiri also handled a traffic of the order of 25,000 tons in 1958-59, all by sailing craft which consisted of the coastal imports of food grains, rice, salt and general cargo and the coastal exports of jaggery, rice and mangoes. This coastal traffic is handled in Rajivada Creek. The total number of passengers embarking and disembarking through Ratnagiri Port from 1950-51 to 1959-60, the tonnage of imports and exports and the number and nett registered tonnage of steamers and sailing craft which visited the port during this period, are given in Appendices VIII & IX attached to this report.

Future traffic

8.17. As far as passenger traffic is concerned, the Committee is of the opinion that the prospects of any increase in the future are not bright. This question, however, is being examined by the Konkan Shipping Services Enquiry Committee, whose report is awaited. With the information available to it the Committee feels that the passenger traffic of the order of 1 lakh persons per annum as at present will continue. As far as cargo traffic is concerned, in the absence of any large scale industries, mining or surplus agricultural produces in the hinterland of this port, there is no likelihood of any appreciable increase in the cargo traffic in the next few years.

Engineering features

8.18. The main proposal put forward by the State Government in respect of Ratnagiri Port is the construction of an all-weather port at Ratnagiri where initially passenger coasting steamers may be accommodated and which at a later date can be further developed for 30 ft. draft cargo steamers as the need arises. There are 4 bays in the stretch of the coastline near Ratnagiri which appear as possible sites for development. These are Kalbadevi Bay and Mirya Bay to the north of Ratnagiri, Ratnagiri Bay, and Paos Bay to the south of Ratnagiri which are shown in Drawing No. IPDC/20 as inset. The Committee after an on-the-spot study during the monsoon season found that Paos Bay was not suitable during the south-west monsoon period owing to its facing the monsoon. No natural shelter was available in this Bay. This Bay could therefore be made suitable for all-weather facilities only by the construction of expensive breakwaters. Kalbadevi Bay which from the point of view of south-west monsoon was almost ideal, was found to contain a sheet of rock in the entire harbour area, as revealed by probings put down by the State Government at the instance of the Committee. The Ratnagiri Bay was also not favoured due to this Bay requiring two breakwaters instead of one in Mirya Bay to get suitable shelter and to prevent the port from silting because of a river debouching in the Bay. Comparative study of hydrographic surveys carried out in 1878 and 1955 in the past indicated silting in this Bay of the order of 6 ft. in 68 years. While this rate of silting is not excessive, it will be desirable to prevent the entry of the silt into the harbour by providing a second breakwater north of the river. This breakwater will also be required to reduce the height of the waves in the harbour area during the south-west monsoon period. In

view of the various difficulties at other sites, Mirya Bay site which requires one breakwater only was considered the most suitable site for silting an all-weather port. Model experiments in respect of this Bay have already been carried out by the Poona Research Station, which proved that such a scheme is feasible.

Model experiments

8.19. The Poona Research Station recommended the construction of a straight breakwater 1500 ft. in length in the first stage for passenger coasters drawing about 22 ft., commencing from Pinnacle Rock and extending northwards roughly parallel to the shore and further extending the breakwater at an angle towards north-east for a deep draft port. The Committee was of the opinion that even in the first phase it would be desirable to extend the proposed breakwater by an additional 100 ft. along the line of the future extension suggested by the Poona Research Station for a 30 ft. harbour. This extension, the Committee felt would prevent the waves veering round the breakwater head and thus disturbing the berthing on the lee side of the breakwater. The layout of the proposed all-weather harbour at Ranagiri as recommended by the Committee is shown in Drawing No. IPDC/20. The Committee was also of the view that this breakwater will have to be designed for 20 ft. waves in the sea especially in view of the fact that it is sited bread-side to the direction of the strike of the waves.

Port development

8.20. Keeping in view that the future prospects of passenger traffic are not bright, the Committee is of the opinion that at this stage, an all-weather port at Ratnagiri is not justified for passenger traffic as the cost of such a scheme is of the order of Rs. 2 crores. Further the steamers and sailing craft using Ratnagiri at present cannot ply during the monsoon. For the present therefore improvements need only be effected to the existing landing facilities at Ratnagiri Bay itself so that passengers can be landed at all stages of the tide, during the fair-weather when the steamers are able to ply. This improvement can be effected by raising and widening the low level jetty now under construction together with ancillary works so as to serve during all stages of the tide. This will substantially reduce the difficulties experienced by passengers. The Committee also thought it desirable to provide a 150 H.P. towing tug to help passenger lighters during unfavourable wind conditions when rowing as is being done at present, becomes slow and inefficient. The Committee estimated these improvements to cost roughly Rs. 15·4 lakh as per details given in Appendix X attached to this report. These works should be given first priority. The provision of essential quarters for staff estimated to cost Rs. 2.00,000 as per details given in Appendix X may however be given a second priority.

CHAPTER IX

BOMBAY STATE

(GUJERAT REGION)

Introduction

9.1. The Gujerat region has a sea board of about 800 miles facing the Arabian Sea, the Gulf of Cambay and the Gulf of Kutch. The coast line of the region can be divided into 3 broad categories; the coastal region facing the Arabian Sea and the Gulf of Cambay on its western side intercepted by the great rivers of Narmada, Tapti and Mahi, the Saurashtra coast line facing the Gulf of Cambay on the east, the Arabian Sea on the south and the West and the Gulf of Kutch on the north; and the arid coast line of Kutch facing the Gulf of Kutch in the south.

9.2. The main industries of the region are textiles, cement, chemicals and edible oil production. Ahmedabad is the industrial hub round which are centred the textile industries, one of the foremost in India. In Saurashtra are located cement factories and a chemical factory at Mithapore near Okha. New cement and chemical factories are also under construction. The chemicals mainly soda ash and caustic soda and the cement from the Saurashtra region find a ready outlet through Saurashtra Ports for coastal distribution. Salt making is another important industry of Saurashtra and Kutch. Large quantities of salt are shipped from this region to foreign and Indian ports. The export of groundnut oil and oil cake from Saurashtra Ports to foreign countries is another notable traffic generated by the industries in Saurashtra. Mineral oil for the industrial requirements of Saurashtra is imported through the Port of Okha for internal distribution. Fishing and boat building are other notable industries. A modern fishing harbour is now under construction at Veraval.

9.3. Amongst the agricultural and forest produces of the State are paddy, cotton, wheat, jawar, bajri, sugarcane, ground nuts, onions, timber and firewood. The main minerals in the State are bauxite, manganese, lime stone and building materials. Oil and natural gas have recently been located in the Cambay region.

9.4. The principal traffic in the Gujerat Ports during 1958-59 were the imports of building materials (*78,452 tons), cement (14,892 tons), mineral oils (1,75,373 tons), food grains and pulses (55,994 tons), cotton seeds (24,648 tons), dates (17,942 tons), iron ore and steel (1,427 tons), gunnies (13,808 tons) and coconuts (10,312 tons). The exports during the same year consisted of salt (5,60,640 tons) cement (34,49,599 tons), oil cakes (1,48,407 tons) ground nut seeds (75,603 tons), chemicals (34,080 tons) groundnut oil (30,372 tons), onions (26,441 tons), cotton raw (24,148 tons) bauxite (13,187 tons) and fish (8,970 tons).

*Figures in brackets show tonnage handled during 1958-59.

9.5. The State of Bombay has a minor-ports organisation headed by a Principal Port Officer and Engineer. The engineering works relating to the ports in the Gujerat region are looked after by three executive engineers in charge of 3 separate marine divisions in addition to one mechanical engineering division.

The Port of Surat

General

9.6. The port of Surat is situated on the east bank of the Tapti river roughly 14 miles inland from the Arabian Sea and 145 miles coast-wise to the north of Bombay. During the 17th century it was an important shipping centre but with the growth of a major port at Bombay, the importance of Surat steadily decreased. Surat is now classified as a minor port but due to the importance that Surat is attaining because of the rapid industrialisation that is taking place and further development expected, the Committee considers that this place deserves development as an intermediate port. The existing port facilities at Surat are described in Appendix VII.

Traffic pattern

9.7. Surat at present caters entirely to sailing craft traffic and serves the needs of mainly the town itself. The port is closed to traffic during the south-west monsoon. During fair weather, the vessels sail up the Tapti to Surat. The navigation of these sailing craft is restricted by several shoals in the stretch of the river between Surat and the sea over which a vessel of 6 ft. draft can navigate only at more than half tide. The annual traffic handled at Surat is of the order of 20,000 tons consisting mainly of coastal imports in onions, tiles, coconut, building stones and coconuts and coastal exports in timber, bamboos, cotton, cotton seeds and oil cakes, From 1950-51 upto 1956-57, the traffic was more or less steady at about 20,000 tons per annum. In the year 1957-58, the traffic showed a sudden increase from about 20,000 tons to 28,000 tons. In 1958-59, there was again a sharp fall, the traffic handled being about 14,000 tons. The tonnage of traffic both imports and exports handled at Surat per annum from 1950-51 to 1959-60 and the number and nett registered tonnage of sailing craft which visited the port during this period is given in Appendices VIII and IX attached to this report.

Future traffic

9.8. The traffic that is being handled at Surat Port at present is that which is consumed or generated in Surat town itself and its immediate vicinity. The future increase of this cargo will bear a proportion to the increased consumption and generation of these commodities in Surat town and at best may rise by 50 per cent in the next 10 years. Due to the new industries at Udhana, a new industrial centre being developed within a few miles of Surat, a further rise of 20 per cent over the existing traffic as forecast by the State Government also seems reasonable. In addition, if an efficient lighterage port is established at Surat as is possible, bulk of the foreign traffic of the hinterland of Surat at present handled by Bombay is likely to use the port of Surat. Thus, the trade at Surat is likely to rise to something like one lakh tons on establishment of a lighterage port at the place. There is also a good possibility of a

passenger traffic developing at Surat. At present passengers travelling from this region to Saurashtra have to travel by train by roundabout route *via* Ahmedabad or Viramgam. The distance by rail, for example, between Surat and Bhavnagar is 308 miles and includes a transhipment from broad-gauge to metre-gauge at Viramgam. If passengers ferry steamers are introduced between Surat and Bhavnagar, the actual sailing distance would only be 54 miles. Thus passengers may find the sea route more convenient, cheaper and less time consuming than the rail route. The Committee is, therefore, of the opinion that considering the future traffic possibilities, Surat which is at present a minor port, should be classified as an intermediate port and developed in the manner recommended in paragraph 9.12.

Engineering features

9.9. The river Tapti has its origin in the high lands of Central India and after a course of about 450 miles enters the sea south of Suvali Point 14 miles down-steam of Surat. The river has an estimated catchment area of 30,000 square miles. Though no recent observations have been carried out, old records show an estimated discharge of 9,00,000 cusecs during seasons of extreme floods and 200 cusecs towards the close of the dry weather months. The 450 miles of the Tapti coast westward of the high-lands of Central India to the sea may be divided into four chief sections: the first, of 150 miles from its source in Satapura Plateau through parts of Madhya Pradesh, upto a few miles below the town of Barhampur where it enters the plains of Khandesh; the second, of 180 miles, which passes across Khandesh; the third, where the waters of the river through 50 miles of hill and rock, forces their way down to the lowland of Gujerat; and the fourth about 70 miles, across the alluvial plains of Surat. The last 70 miles of the Tapti's course are actually divided into two parts, above and below the limit of the tidal wave. Of these the upper fresh water section includes about 40 miles and the tidal stretch about 30 miles. At the Surat roads, the main tidal rise at springs is 19 ft. and that at neaps 15 ft. But further up the river near Surat, the rise of the tide at springs is 15 feet. Water level in the river near Surat may rise by about 20 ft. during the rainy season.

9.10. A survey carried out in 1925, indicated 9 shoals in the stretch of the river between the sea and Surat. These shoals and the depth over the shoals at the various stages of the tides are given in Appendix XX. It must, however, be noted that the shoals and the channels of this river are continuously altering. A subsequent hydrographic survey was carried out in 1957 but exceptional floods in the river Tapti in 1959 has completely changed the regime of the river. The existing state of affairs can only be assessed if a new hydrographic survey is carried out.

9.11. Though no steamers call at Surat at present, there is a recognised anchorage for steamers near the mouth of the river Tapti having a depth of about 39 to 42 ft. below L.W.O.S.T.

Port development

9.12. The Committee is of the opinion that further developments at Surat should be undertaken at a new site where the present difficulties which the sailing craft experience in negotiating the 9 sand bars between

the sea and Surat and thus losing valuable time, are reduced to a minimum. The present port site at Surat is ill-suited for future expansion. The Committee consider that the stretch of the river at Magdala about 8 miles down stream of Surat and 6 miles from the sea which was recommended by the Bombay State Government, is a suitable site for development as a sailing vessel-*cum*-lighterage port. This stretch is both stable and fairly deep where sailing vessels of 8 ft. draft are able to come up during any day of the year at high tides. This site will also avoid the more difficult shoals between Magdala and Surat which the sailing vessels have to cross at present. There are six shoals in this stretch, whereas below Magdala there are only three. Magdala is also only six miles from Udhana, the new industrial centre being developed near Surat. Magdala can be conveniently connected to Udhana by road and by rail to Udhana and the broad-gauge system of this region, if a rail link is required at a later date. The port site at Magdala has also ample room for future expansion. The construction of such a port will also enable a ferry passenger service being introduced between Bhavnagar and Magdala, thus avoiding the round-about railway route between the Gujerat coast and the Saurashtra peninsula. The Committee therefore recommends the development of a new port at Magdala with the following facilities in the first stage of development. A reinforced concrete jetty with a small transit shed; the provision of water-supply and electric lighting at the wharf; the acquisition of a 150 B.H.P. tug for towing country craft and lighters; bank protection work to protect against possible erosion at the site of the port; an approach road connecting the port site with the main Surat-Dumas road; and the construction of an office building and residence. These works are estimated to cost Rs. 12·10 lakhs as per details given in Appendix X and are considered to be of first priority for Surat Port. Drawing No. IPDC/21 shows the proposed development at Magdala.

The Port of Broach

General

9.13. The Port of Broach is located on the north bank of the Narmada river 32 miles inland from the Gulf of Cambay and approximately 166 miles coastwise north of Bombay. It is classified as an intermediate port. The history of Broach is similar to that of Surat Port. With the development of Bombay Port and the growth of railways, the port gradually lost its importance. A list of the existing port facilities at Broach is given in Appendix VII. Drawing No. IPDG/22 shows the layout of these facilities.

Traffic pattern

9.14. As in the case of Surat, Broach is entirely a sailing vessel port catering to the needs of Broach town. The port is open throughout the year but during the south-west monsoon period, traffic is restricted to ports in the Gulf of Cambay. The craft using the port sail up the river to Broach under great difficulties due to the occurrence of four sand bars between the sea and Broach, with hardly sufficient water over some of them even at high water neaps. Under unfavourable wind and tide conditions, the sailing craft take 3 days or more to reach Broach from the sea.

9.15. The average annual traffic handled at Broach is of the order of 50,000 tons per annum. The traffic consists mainly of the coastal imports of tiles, coconuts, onions, salt and other general cargo and the coastal exports of bamboos, cotton seeds, food-grains and miscellaneous general cargo. In 1950-51, the port handled a traffic of 37,000 tons which steadily increased to 55,000 tons by 1954-55. Since that year the traffic registered a steady fall and in 1958-59 it stood at about 18,000 tons. The tonnage of traffic handled at Broach from 1950-51 to 1959-60 and the number and nett registered tonnage of sailing vessels which visited Broach during these years are given in Appendices VIII and IX.

Future traffic.

9.16. The traffic at Broach Port may be expected to rise by about 50 per cent in the next 10 years. Broach, because of its distance from the Gulf of Cambay and the bars on the way is not suitable for lighterage facilities. Had it been possible to provide a lighterage port in the vicinity, then there would have been possibilities of an additional traffic of about 80,000 tons of manganese ore exports. The Pani mines near Shivrajpur at present produce about 80,000 tons of manganese ore per annum which are exported to foreign countries through Bombay Port, 299 miles distant. A lighterage port in the Narmada region, had it been possible would have reduced the distance the ore had to be transported by at about half.

Engineering features.

9.17. The Narmada river is one of the 8 rivers which debouches in the Gulf of Cambay. The length of the river including its branches is about 750 miles and the drainage area covered is of the order of 37,500 sq. miles. The annual floods bring down a great quantity of silt in suspension. The banks are also liable to severe erosion. The river is roughly 2,500 ft. wide at Broach but widens out to about 11 miles at its mouth. There is no bar across the mouth of the Narmada but there are a number of bars across the river itself between Broach and the Gulf of Cambay. A comparative study of the Admiralty Chart prepared in 1910 and the longitudinal soundings of the river carried out by the State Government in 1959 at the instance of the Committee indicates that considerable deterioration has occurred in depths in different stretches of the river as may be seen in Drawing No. IPDC/22 attached to this report. The worst deterioration appears to be in the navigable channels in the stretch between Jageshvari and Ambeta where the original depths of 20 to 24 ft. available in 1910 have been reduced to about 1 to 2 ft. From the longitudinal soundings carried out in 1959, it is also seen that there are at present 4 shoals between the sea and Broach which hinder navigation. These shoals are described in Appendix XXI attached to this report. The worst of these shoals is the one opposite Varwara. This shoal is approximately one mile in length, the bed level being 2 ft. above L.W.O.S.T. at the highest places.

9.18. The Narmada river is tidal upto Ratnapur, at a distance of 25 miles beyond Broach. The tidal particulars in the river between the sea

and Broach as actually observed by the State Government are given below:—

1	2	3	
Serial No.	Place	Actual observed ranges	
		in springs	in neaps
1.	Broach	10 ft.	6 ft.
2.	Bharbhut	13 ft.	8 ft.
3.	Vengni	18 ft.	12 ft.
4.	Ambeta	28 ft.	17 ft.

Port development.

9.19. The improvement to the navigable channels of the Narmada upto Broach had been the subject of expert studies and investigations from 1900 upto 1930. The conclusions reached at that time were that any dredging on the navigable channels from the sea upto Broach were unlikely to be effective for more than a season as the monsoon freshets every year with the large quantities of silt which they carry would soon obliterate any cuts made in the previous dredging season. The annual dredging cost would, therefore, be prohibitive. Similarly, the training of the river by the construction of groynes and revetments would also be very costly and beyond the means of Broach Port.

9.20. The State Government suggested to the Committee, for its examination, a proposal to construct an all-weather port for ocean going liners at Dahej near the mouth of the Narmada. The Committee found, the proposal for an all-weather port unsuitable because of the shallow sea bed and continuous silting at the site. Nor could the Committee find any other suitable site for a deep draft or a lighterage port in the vicinity of the Narmada estuary.

9.21. In view of the above the Committee decided to examine measures required to improve Broach as a sailing craft port. The Committee consider that the best way to improve the working of the port is to provide one or more tugs for towing the sailing craft at high water from Broach to the Gulf or *vice versa*. With a properly organised towing service the time taken by the sailing craft for this short distance of 32 miles can be reduced from about 3 days to about one day. In addition the existing reinforced concrete jetty should be extended by another 250 ft. to enable more sailing vessels to be alongside and discharge their cargo. This extension is necessary more to reduce the congestion created by bunching of craft all of which come at high water than to increase the capacity of the port. The estimated cost of these proposals together with ancillary facilities is estimated at about Rs. 12·6 lakhs as per details given in Appendix X. These works should be given first priority.

9.22. The Committee also recommend that systematic hydrographic surveys should be carried out and the channels suitably marked. The introduction of portable type of flashing beacons would further help navigation in the river during night. At key shoals, as for example, the shoal opposite Warvara, dredging may also be undertaken with one of the State Government's dredgers ear-marked for internal dredging to enable sailing craft drawing 8 ft. to ply at high water neaps. The Committee consider that the provision of navigational aids for night navigation and the construction of quarters for port staff estimated to cost Rs. 1·75 lakhs as per details given in Appendix X are also necessary for Broach. These works however may be given a second priority. The cost of the yearly hydrographic surveys and dredging not being capital works may be met from the revenues of the port.

The Port of Bhavnagar

General.

9.23. The Port of Bhavnagar is located near the head of the Gulf of Cambay on its west coast. It is one of the most important intermediate ports in the new Gujerat State. It is also one of the two intermediate ports in the whole of India where ocean going steamers can be worked alongside. The port is developed at two sites; the old port known as the "Steel Jetty" area, constructed in 1924, which is used mainly by country craft and lighters and the new port or "Concrete Jetty" completed in 1956, for ocean going steamers. Drawing No. JPDC/23 shows the lay out of the port facilities at the "Concrete Jetty" and a location plan indicating Bhavnagar channel and the "Concrete" and "Steel Jetty" areas. A list of port facilities at Bhavnagar is given in Appendix VII attached to this report.

Traffic pattern.

9.24. From 1950-51 the port of Bhavnagar has been handling a steady traffic of the order of 2½ lakh tons per annum. The volume of traffic handled at Bhavnagar from 1950-51 to 1959-60, and the number and nett registered tonnage of steamers and sailing craft which visited the port during this period are given in Appendix VIII and IX attached to this report. A detailed analysis of the traffic at Bhavnagar for the year 1958-59 indicates that out of the total traffic of 2,29,690 tons consisting of 96,318 tons of imports and 1,32,653 tons of exports, the steamer traffic was 1,39,372 tons making 60·5 per cent of the total traffic, and the sailing craft traffic was 90,579 tons. The foreign trade handled at the port amounted to 34% of the total traffic. The principal commodities handled at Bhavnagar during 1958-59 were the imports of building materials, food grains, mineral oil, iron and steel, timber, coconuts gunnies, cotton seeds and miscellaneous general cargo and the exports of oil cakes, salt, onions, ground nut seeds and oils, raw cotton, bone and bone meal. The bulk of the traffic at Bhavnagar is that which originates at or is destined for Bhavnagar town and the district of Gohilwar.

Future traffic.

9.25. The State Government estimated a future traffic of 8,00,000 tons at Bhavnagar. The Committee, however, found that this forecast of traffic is based on two assumptions, firstly the industrial development

of the immediate vicinity of the port, and secondly, a broad gauge railway link between Ahmedabad and Bhavnagar to tap the Ahmedabad traffic. As Kandla is being connected to Ahmedabad by a broad gauge railway link there would seem to be no immedite prospect of Bhavnagar being connected with Ahmedabad with a broad gauge link. Further Kandla Port is built to handle much bigger ships than Bhavnagar can. Under these circumstances the Committee feels that the future traffic for purposes of present development at Bhavnagar Port should be estimated on the basis of its immediate hinterland. The Committee is of the opinion that on this basis, the traffic of this port may rise to 1,00,000 tons in the next few years.

Engineering features.

9.26. The main problem of Bhavnagar is the silting in Bhavnagar channel leading to the port from the Gulf. The former Saurashtra State Government invited Prof. Thyjsse, Director of the Water-loopkundig Laboratorium, Delft, Holland, in 1950, to investigate the problem of siltation at Bhavnagar. His findings, after several months of study, are summarised below:—

"(a) Bhavnagar Creek leading upto the original harbour (Steel Jetty) has silted upto a considerable extent in the last century. When the depths at the Old site threatened to become insufficient for operation of big ocean going ships, a new harbour (Concrete Jetty) has been constructed close to the deeper water of the Bhavnagar Channel. Since the inauguration of the "Concrete Jetty" in 1937, the cross section of Bhavnagar Channel has diminished to a great extent. The depths in the channel are hardly sufficient at this moment to allow ships of great draught to approach the harbour at high water neap tides. If the process will go on, ships will suffer serious trouble in the near future.

(b) The means considered by Prof. Thyjsse for improvement to the Channel were:

(i) Stopping the supply of silt.

(ii) Turning new tidal flow through the channels besides the present one.

(iii) Maintaining the depth by dredging.

(iv) Increasing the depth at the cost of less width of the channel. None of these means were found to be effective by Prof. Thyjsse either from the technical or economic point of view.

(c) The future of the Bhavnagar Channel has been predicted by Prof. Thyjsse on the basis of the silting of the channel in the 25 years preceding 1950 and the frequency distribution of high waters. The possibilities of shipping were then deduced by him as follows:—

Draught of Ships.	25 ft.	20 ft.
Phase A	Reached	Before 1965
Phase B	Before 1965	1955-1985
Phase C	" 1970	1960—90

In phase A difficulties arise. When Phase B is reached ships must wait for several days before a suitable tide occurs, while in Phase C shipping is seriously handicapped because the passing of the channel is only possible with 50% of all tides. It may often happen that a ship will have to wait for a week or more before the tide is high enough."

9.27. The Committee having examined the subsequent surveys of Bhavnagar Channel carried out by the State Government in 1956, 1957 and 1958, noted that the rate of silting in the channel in regard to depth had decreased after 1951 and that it was considerably slower than visualised by Prof. Thyjsse, but in regard to the width of the channel, it was found that the channel is continuing to become narrower. The upper reaches of the Gulf were also found to be gradually deteriorating which would have the effect of reducing the tidal prism required for maintaining the channel. Due to the lack of adequate technical data, the Committee is unable to predict the future of Bhavnagar channel except to say that it would be possible to maintain the approach channel to the port for a number of years by gradually increasing the dredging of the Bhavnagar channel.

9.28. The tidal data in respect of Bhavnagar Port are given below:—

	feet
Mean Low Water Springs	+4·7
Mean Low Water Neaps	+11·58
Mean High Water Neaps	+27·5
Mean High Water Springs.	+33·5

9.29. There is a sheltered outer deep water anchorage having a depth of 40 ft. below L.W.O.S.T. where steamers which are unable to reach the 'Concrete Jetty' due to restrictions in draft are worked. The position of anchorage is roughly 2¼ miles off shore and 6 miles from the Concrete Jetty. Swinging of the vessels due to tides, along with the short choppy sea in the anchorage, make lighterage at ships rather difficult at times.

Development works now under execution

9.30. A scheme known as the Water Impounding Scheme is now under execution in the Concrete Jetty area of Bhavnagar Port. This scheme estimated originally to cost Rs. 43,00,000 envisages the construction of a lock with a single gate and necessary flanking embankments so that the water can be impounded at a level of not lower than — 24 ft. At present the Concrete Jetty berths are tidal and a depth of 20 ft. below L.W.O.S.T. is being maintained at these berths by heavy dredging, with the result that ships of greater draft generally sit on the soft mud bottom during low tides. Construction of the water impounding scheme is meant firstly to give floatation to vessels berthed alongside during all stages of the tide and secondly to reduce the heavy silting in the harbour area and thus the quantum of maintenance dredging.

Further development

9.31. The Committee considered the various technical aspects of the Water Impounding Scheme after making a study of the report of the Consulting Engineers employed by the State Government for this project. The dominant feature of this project appears to be desiltation of the dock. The Committee felt that at the most only two ship movements would be possible at any high tide period. The Consulting Engineers had also mentioned that the dock gate would not be frequently used as they visualised only two berths to be in operation inside the dock. The width and sill level of the entrance are 75 ft. and + 3·00 respectively. The Committee considered that the maximum beam of steamers which may enter the lock can only be 65 ft., but movement to and from for steamers of this beam would be extremely slow and would have to be carried out with caution. The sill level of — 3·00 put a limit on the draft of the vessel which may enter the dock. The normal high water springs available for about 230 days in a year is about 33 ft. and allowing for a clearance under the keel of 1 ft. over the sill and 3 ft. fall in water due to the time required for opening and closing the gate for movement of two ships a tide it will be possible to bring in ships of above 26 ft. draft during these days. Beyond these drafts, there will be a small number of days in a year when steamers with deeper draft can enter the port. It may also be mentioned that if the movement per tide is restricted to one ship, it will be possible to increase the draft by about 1 ft. The restrictions in respect of beam, draft and the number of movements of ships limit the capacity of the dock basin in respect of the number and the size of ships that can take advantage of the basin.

9.32. The Committee considered that the Water Impounding Scheme under construction required certain additional works to make it work more efficiently. It is considered necessary to have warping jetties on both sides of the entrance instead of only one provided on the southern side and to extend the latter beyond the northern one by the length of a ship. The extension of the southern jetty should be suitably curved to facilitate the turning of ships from Bhavnagar channel to the lock gate. Two electric capstans should also be provided on the lock to facilitate the handling of ships through the entrance. It will also be necessary to provide an additional 750 B.H.P. tug with a bollard pull of 12 tons and capable of turning and manoeuvring in not more than twice her length, as two tugs of this type will be required for handling ships at Bhavnagar while the port has only one such tug. The Committee was told that to flush the approach channel it was intended to partially open the gates when the water in Bhavnagar channel was very low. The Committee considers that this will not be free from risk as a great difference in head on the two sides of the gates may cause heavy scour and undermine the foundations of this lock. The Committee advises that these scouring operations should be carried out when the difference in water levels on the two sides is of the order of only about 2 to 4 ft. It will also be necessary to watch the scour caused by these operations and to suitably adjust the same. The Committee also recommends the marking of the approach channel to the dock with buoys. In the opinion of the Committee, the proposals made above for improving the working of the lock gate scheme should be given the first priority at Bhavnagar. The estimated cost of this project is Rs. 34,40,000, as per details given in Appendix X attached to this report.

9.33. The Concrete Jetty as existing at Bhavnagar, is away from the transit shed with the result that goods landed on the pier have to be transported for a distance for taking them to or from the transit sheds. The Committee is of the opinion that to improve the efficiency of this handling, 4 Nos. fork lift trucks estimated to cost Rs. 2·4 lakhs should be introduced in the first instance.

9.34. The State Government have put forward a proposal for locating an oil berth inside the proposed impounded dock at Bhavnagar. The Committee considers that it is highly undersirable to discharge dangerous oils inside an impounded dock, the gates of which can be opened only at high tide. No provision should, therefore, be made for oil discharge at this port. Oil requirements for this port will have to be met from other sources. For oil bunkering purposes, if trade justifies, a barge with tanks and pumps may be maintained.

9.35. In order to enable large steamers which are not capable of entering the impounded dock now being constructed, to be worked in the anchorage, the State Government proposed the construction of lighterage facilities in Akwada Creek situated close to the Concrete Jetty area. At present all lighters use the steel jetty. After the impounding of the concrete jetty, lighterage of big ships, that can not enter the basin, can continue to be handled from the Steel Jetty. Providing lighterage facilities at the Akwada Creek would no doubt reduce the distance to be traversed by the lighters and increase the working time of lighters because of better depths in this creek but as the number of big ships coming to this port is not likely to be large this work is not considered as one of high priority. The Committee would, however, like to record that with the continued silting of the channel leading to the Steel Jetty it will eventually be necessary to shift the sailing craft-*cum*-lighterage port from the Steel Jetty to a Akwada Creek. The necessity of this is likely to arise after some years and the work need not be considered at present. This may be given third priority as per Appendix X.

9.36. The Government of Bombay proposed construcion of three more general cargo berths in the basin. Looking to the traffic expected in a reasonable time as mentioned above the Committee did not consider the provision of these berths an urgent necessity. To take care of possible bunching of ships that can enter the basin it will suffice if the turning basin inside the impounded dock is increased to 1000 ft. diameter and if one mooring together with necessary lighterage wharf is provided. These works are shown in Drawing No. IPDC/23. The bed level of the basin and at the berths should not be higher than 3 ft. so that steamers of say 25 ft. can lie afloat when the gate in open during neap tides and the water level falls to 24 ft. as will happen while scouring silt from the approach channel during neaps.

9.37. The Committee also considers it necessary to provide suitable office accommodation in the Concrete Jetty area, as the existing office is far away in the town. This will enable better control of the dock operation. The Committee also accepts the proposal of the State Government to provide quarters for essential port staff. Repair facilities in terms of portable tools, air compressors, etc., may also be provided in the Concrete Jetty. The proposal for augmenting water supply to the port area is also considered necessary. The Committee felt that these proposals together with the provision of lighterage facilities inside the dock

area, should be given second priority. The total cost of these works is estimated to be Rs. 40·25 lakhs as per details given in Appendix X.

9.38. The Ship Repairs Committee had recommended that at Bhavnagar Port, the existing dry dock should be extended and deepened so as to take vessels of 350′ length, 45′ breadth and 15 ft. draft and that in the impounded dock, one of the new berths should be earmarked for ships repair work and fully equipped with all repair facilities. In respect of this recommendation, the Committee is of the opinion that the present dry dock located in the Steel Jetty site should not be extended as the site of this dry dock is a dying site. A new dry dock may be provided in the new port area when funds permit. As regards earmarking one of the new berths for ship repairs this Committee has not recommended the construction of any new berths.

The Port of Veraval

General

9.39. The Port of Veraval is located on the south-west cost of Saurashtra on the Arabian Sea roughly 62 miles south of Porbandar coastwise. It is an inter-mediate port of the new Gujerat State. The entrance of the harbour is protected by a break-water on the west side and by main land on the north and east forming an artificial Bay. This port is an important fishing centre and is noted for boat-building. The sailing craft based on adjoining ports take shelter at Veraval during the monsoon season. The existing port facilities at Veraval are shown in Drawing No. IPDC/24 attached to this report. The list of port facilities available at Veraval is given in Appendix VII.

Traffic pattern

9.40. The Port of Veraval handled a traffic of about 1,08,000 tons in 1950-51. This traffic has steadily increased to 1,70,000 tons by 1958-59. The volume of traffic handled at Veraval Port from 1950-51 to 1959-60 differentiating between imports, exports and sailing craft and steamer traffic is given in Appendix VIII. The number and nett registered tonnage of sailing vessels and steamers which visited Veraval during the same period are given in Appendix IX. An analysis of the traffic for Veraval in the year 1958-59 indicates that imports amounted to 66,730 tons and exports 1,03,000 tons. Out of this the foreign trade was 29,800 tons being 17.4 percent of the total trade. The steamer traffic was 40,887 tons, being 23.9 per cent of the total traffic. The sailing vessels traffic amounted to 1,29,753 tons being 76.1 per cent of the total trade. The main articles of imports and exports of this port are; imports of building materials, cocoanuts, cotton seeds, food-grains, betel nuts, dates, fuel oil, gunnies, iron and steel, kerosene oil, lubricating oil and timber; exports of raw cotton, fish, food-grain, ghee, lime and lime-stone, oil cakes, ground-nut oil, onions, castor seeds and ground nut seeds. The port is closed to traffic during the south-west monsoon period.

Future traffic

9.41. The industries now being installed in the vicinity of Veraval consist of a Rayon factory at Veraval town, a cotton seed crushing plant with a crushing capacity of 100 tons per day, and a small cement factory with a rated capacity of 150 tons per day, the last two being located at

Chorwad, 12 miles from Veraval. A license for a new cement factory with a rated output of 165 tons per day has recently been issued. Based on this industrial potential, the State Government estimated the following traffic by the end of the Third Five Year Plan period:

Commodities	Forecast	Remarks
(a) *Imports*		
(*i*) Existing traffic in betel nuts, building materials, cocoanuts, cotton seeds, dates, food grains, fuel oil, iron and steel, kerosene lubricating oil and miscellaneous cargo.	70,000 tons	
(*ii*) Increase on the above . . .	10,000 tons	
(*iii*) Pulp	10,000 tons	Required for the Rayon factory now being installed.
(*iv*) Coal	50,000 tons	Increase in fuel needs at Veraval.
TOTAL .	1,40,000 tons	
(b) *Exports*		
(*i*) Existing traffic consisting of raw cotton, fish, foodgrains, ghee, lime, lime-stone, oil cakes, ground-nut oil, onions, caster seeds, ground nut seeds and miscellaneous cargo	1,00,000 tons	
(*ii*) Increase on the existing traffic .	65,000 tons	Mostly in ground nut seeds, oil cake and lime stone.
(*iii*) Cement	1,15,000 tons	
TOTAL .	2,80,000 tons	
TOTAL OF IMPORTS AND EXPORTS .	4,20,000 tons	

9.42. The Committee felt that it will be reasonable only to expect a traffic of 3 lakh tons per annum by the end of the Third Five Year Plan as per details given in below:—

Commodities	Forecast in tons	Remarks
Existing trade	1,70,000 tons	
Normal increase in traffic . . .	63,000 tons	Based on the increase of trade from 1950-51 (1,08,000 tons) to 1958-59 (1,70,000 tons) *i.e.* 7,000 tons per year average.
Cement	50,000 tons	
Pulp	10,000 tons	
TOTAL SAY .	3,00,000 tons	

Engineering features

9.43. The coast line at Veraval trends in a north-westward direction. The harbour for small craft is formed by a break water projecting in a north-west and south-east direction from the bulge in the coast-line south of Veraval town. An approach channel for sailing craft runs parallel to the break-water at a distance varying from 600' to 1000'. The bed of the inner harbour consists of rock. There is a submerged coral reef between the channel and the breakwater. There is a minimum depth of 13' of water at lowest low water in the basin and the approach channel. At the end of the monsoon season the basin is silted up by about 5' and is dredged during the course of the working season.

9.44. The predominant direction of strike of the waves at Veraval appears to be from the south-west during the south-west monsoon period. The highest waves that have been recorded in the sea off Veraval are 15' to 16' in height but during exceptional storms in the Arabian Sea, it is likely that waves upto 20' may be encountered. The available tidal particulars in respect of Veraval are: the mean higher high water + 7.8' and mean lower high water + 7.2'.

9.45. An idea of the drift at Veraval may be obtained from the breakwaters constructed at Mithapur near Okha about 132 miles north of Veraval. These breakwaters were built in 1935 to protect an approach channel for feeding salt water to the Tata Chemicals Factory. The Poona Research Station has calculated the amount of drift intercepted by these breakwaters on either side since they were constructed. Since the breakwaters extended to only a depth of 10 ft., the quantities thus calculated are for the drift above this level. The quantities of drift at Mithapur are 3250 cubic yards per annum from north to south and 6150 cubic yards from south north. The direction of strike of the waves at Mithapur is more tangential to the coast than at Veraval since the coast line at Mithapur trends in north-east direction whereas at Veraval the direction of the coast line is from north-west to south-east. In view of this the direction of strike at Veraval is more normal than at Mithapur from which it may be inferred that the quantum of drift to be tackled at Veraval would be less than at Mithapur and should not present any difficulties from the engineering point of view.

Development of Veraval into an all-weather port

9.46. At the instance of the State Government, model experiments were carried out at the Poona Research Station to determine the best manner in which an all-weather port could be developed at Veraval, especially for fishing. The alignment of the breakwaters suggested by the Poona Research Station is shown in Drawing No. PPDC/ attached to this report. In essence the proposal is for the construction of an all-weather port by the extension of the existing breakwater by 650 ft. and the provision of a second breakwater of 1600 ft. on the north-east side. An approach channel will be dredged from the sea which will terminate in a turning basin in the shelter formed by the breakwaters. Preliminary estimates prepared by the State Government indicated the cost of the work to be in the region of Rs. 3 crores. The Committee, however, noted that investigations in respect of the material to be dredged and other data are still to be carried out. The cost of the scheme can therefore be correctly assessed only if these investigations are completed. In view

of the fact that the Committee's forecast of traffic by the end of the 5rd Five Year Plan is only 3 lakh tons, the Committee felt that this traffic could easily be handled in a lighterage port.

Port development

9.47. The Committee is of the view that for handling the expected traffic efficiently at Veraval, it will be necessary to obtain 4 electric cranes of 1½ to 3 tons capacity and 350 H.P. tug for towing the lighters to and from the anchorage. The Committee also feels that the warehousing accommodation at Veraval should be increased by another 50,000 s.ft. The total estimated cost of these works is Rs. 15.5 lakhs as per details given in Appendix X attached to this report and these works should be given first priority at Veraval.

9.48. The Committee is of the opinion that the following works costing Rs. 26.5 lakhs may be given a second priority for Veraval. These include the acquisition of additional 4 Nos. 1½ ton to 3 ton electric wharf cranes, the acquisition of additional workshop equipment, the increasing of the lighterage capacity by another 600 tons, the provision of essential quarters for port staff, the construction of road and rail sidings approximately 2 miles in length and the provision of additional warehousing accommodation of 50,000 s.ft. The detailed break-up of the costs of these works is also given in Appendix X attached to this report.

THE PORT OF PORBANDAR

General

9.49. Porbandar is one of the most important intermediate ports in the new Gujerat State. It is exclusively a lighterage port at present, the anchorage for deep sea vessels being in the sea about 2 miles off shore. The port facilities are built mainly on the left bank of the creek which takes a sweep from the north, flows parallel to the coast and finally enters the sea in a southerly direction. An island has been formed in the middle of the creek with reclaimed material. There is a submerged rock near the entrance marked by buoys. The right bank near the entrance is also of rock with an overlay of sand. The port is closed during the southwest monsoon period from 15th May to 15th of September. Drawing No. IPDC/25 shows the existing lay out of the lighterage port at Porbandar. The list of port facilities available at Porbandar is given in Appendix VII.

Traffic pattern

9.50. Since 1950-51, the Port of Porbandar handled a steady traffic of 1,50,000 tons per annum. The volume of traffic handled at Porbandar from 1950-51 to 1958-59 and the number and nett registered tonnage of steamers and sailing vessels which visited the port during this period are given in Appendices VIII and IX. An analysis of the traffic handled at this port during 1958-59 indicates that out of the total trade of 1,45,664 tons during that year, the imports amounted to 54,993 tons while the exports were 90,671 tons. The steamer traffic during this year amounted to 47.3% of the total trade. The foreign trade at the port was 41,359 tons being 28.4% of the total traffic. The principal commodities handled at Porbandar during 1958-59 included the imports of building materials,

cotton seeds, food-grain, dates, mineral oils and timber and the exports of cement, raw cotton, oil cakes, food grain, ghee, lime and lime stones and ground nut oil and seeds. Out of the exports, salt takes a major share of about 32,000 tons. The port also has a passenger traffic particularly from and to African ports. During the fair season steamers from and to Africa the port, it being the nearest on the Saurashtra coast line on the sea route to Africa. In 1958-59 2,764 passengers disembarked while 2,089 embarked from the port.

Future traffic

9.51. At Porbandar there is already an A.C.C. cement factory with a capacity of about 40,000 tons per annum. This factory is at present producing white cement. A new cement factory at Ranavav in the vicinity of the port, having an initial capacity of 700 tons per day with duplication planned so as to attain 1400 tons per day is now nearing completion. The A.C.C. have plans for the construction of a new factory, with a capacity of 650 tons per day. A new Soda Ash plant is also nearing completion at Porbandar. This factory will have an initial capacity of 200 tons per day which can be stepped up to about 400 tons per day. A steam power plant for electric supply at Porbandar has recently been put in commission. The expected coal requirements of this plant is roughly 1,00,000 tons per annum.

9.52. It is also reported that there are deposits of bauxite in the vicinity of Porbandar, which may be exploited for export by the construction of a road connecting the areas round about the present port of Lamba.

9.53. Based on the industrial potential at Porbandar, the State Government made a traffic forecast of 6.5 lakh tons per annum for Porbandar Port by the end of the Third Five Year Plan as per details given below:—

(*i*) Existing trade	1,50,000 tons	
(*ii*) Cement and soda ash	1,95,000 tons	Assuming 50% of production to go by the sea route.
(*iii*) Expected movement of coal	1,00,000 tons	Assuming the entire requirement of coal for the steam plant to go by sea route.
(*iv*) Bauxite	50,000 tons	
(*v*) Lime stone	30,000 tons	
(*vi*) Increase in agricultural traffic	11,500 tons	
(*vii*) Increase in miscellaneous industrial traffic	25,000 tons	
(*viii*) Non-industrial traffic	85,000 tons	
	6,46,500 tons	
	or 6·5 lakh tons	

9.54. The Committee, however considered that it will be reasonable to expect only an additional traffic of 2 lakh tons over and above the

existing traffic by the end of the Third Five Year Plan as per details given below:—

(*i*) Existing trade	1,50,000 tons
(*ii*) Cement	1,00,000 tons
(*iii*) Soda ash	50,000 tons
(*iv*) Bauxite	25,000 tons
(*v*) Miscellaneous cargo . . .	25,000 tons
TOTAL .	3,50,000 tons

Engineering features

9.55. The coast line at Porbandar trends in a north-west to south-east direction. Porbandar creek on which the lighterage facilities are located enters the sea just on the west of Porbandar town. The coast line bulges out slightly at Kadar Pir on the west of the creek resulting in a small embayment off Porbandar.

9.56. Trial bores sunk in the sea off Porbandar in connection with the development of Porbandar into an all-weather port indicate the material to differ widely, the material varying from fine sand and silt to stiff clay and layers of hard lime stone and black rock. The exact locations of the borings and the nature of the strata encountered are given in Drawing No. IPDC/25.

9.57. Detailed analysis of wave directions, periods and heights, carried out by the Poona Research Station, based on information collected by ships in the Arabian Sea in the area bounded by latitudes 20° and 25°N and longitudes 65° and 70°E., for a period of 5 years between 1949 and 1953, indicates that the predominent direction of the strike of the waves is from the south-west during the south-west monsoon period. Highest waves that have been recorded are 15 to 16 ft. high, but it is likely that waves upto 20 ft. may be generated during cyclonic storms. The tidal particulars in respect of Porbandar are:

Higher high water springs	+9·6/
Mean higher high water	+8·7/
Mean lower high water	+7·8/
Local mean water level	+5·9/
Mean higher low water	+4·8/
Mean lower low water	+2·5/
Lower low water springs	+1·2/

The strengths of tidal currents in the sea off Porbandar as measured by the State Government indicate that both during the flood and ebb, the strength seldom exceeds 1 knot. In the offing, the tidal streams are not perceptible; high water occurs at Porbandar earlier than at any other port of the coast causing flood tidal streams to diverge in a northerly and southerly direction. In the Porbandar Creek, the ebb runs very strongly and continues for some time after the time of low water. Great care is necessary when leaving the creek on the ebb to avoid being set on the reef abreast of the entrance.

9.58. An idea of the drift at Porbandar may be obtained from the breakwaters at Mithapur near Okha and about 70 miles north of Porbandar, constructed in 1935 to protect an approach channel for feeding the salt water works constructed for Tata Chemicals. The quantity of sand accreding on each side of breakwaters since the construction of the breakwater has been measured by the Central Water and Power Research Station. These breakwaters extend to a depth of only 10 ft. and so only the littoral drift above this level has been intercepted. The annual quantities of drift at Mithapur are 3,250 cubic yards per annum from north to south and 6,150 cubic yards per annum from south to north. The coast line at Mithapur trends in a north-east to south-west direction, whereas at Porbandar the direction is from north-west to south-east. The direction of strike at Porbandar is, therefore, the more normal than at Mithapur from which it may be inferred that drift at Porbandar may even be less than at Mithapar. From the engineering point of view, therefore, there should be little trouble in dealing with this amount of littoral drift.

Development of Porbandar Port into an all-weather Port.

9.59. The State Government invited a firm of Consulting Engineers from the U.K. to report on the construction of an all-weather port at Porbandar. Model experiments were also carried out at the Poona Research Station. The scheme as finalised by the Consulting Engineers after the model experiments have been completed, consists of a breakwater almost parallel to the coast from a point near Kadar Pir to the sea terminating in a 'Y' shaped head. The breakwater is roughly 5,000 to 6,000 ft. in length. A second breakwater is also proposed which is 1,000 ft. in length, to protect the harbour from the south-east direction. An approach channel 300 ft. in width, dredged to 26.0 ft. through rock, sand and clay will connect the harbour with the sea. The approach channel is to terminate in a dredged turning basin on the lee of the breakwater. In the initial stage 2 moorings may be provided in the lee of the breakwater for working the steamers all through the year.

9.60. From the engineering angle, the scheme put forward by the State Government appears to be reasonable. The Committee, however, felt that from the navigation point of view the approach channel would have to be widened to 800 ft. and the channel near the breakwater head to 1000 ft. to allow for monsoon conditions when the swell and winds would be broad side to the ships approaching or leaving the harbour since it may not be possible to have the assistance of tugs for manoeuring the ships in the exposed channel during rough sea conditions. It may even be difficult for pilots to board the ships in the open sea in rough weather. Under the circumstances, the ships approaching the proposed all-weather port at Porbandar may navigate to and from the port at times without the full assistance of pilots and tugs. These considerations lead the Committee to recommend a wider approach channel at Porbandar.

9.61. The Committee estimates the cost of the work including the breakwater, a wider approach channel and the provision of a 750 H.P. towing tug for handling ships in the turning basin at Rs. 526 lakhs as per break-down given below. This excludes the cost of other essential facilities required at a port of this nature, as the Committee was given to understand by the State Government that auxiliary facilities such as,

water supply, dredgers, survey and pilot launches, electricity, an adequate workshop and slipway, offices, marshalling yards, roads and railways are already available in the port.

(i) Dredging	Rs.	288 lakhs
(ii) Construction of breakwaters	Rs.	183 lakhs
(iii) Mooring berths, beacons, etc.	Rs.	19 lakhs
(iv) Twin screw 750 HP tug	Rs.	16 lakhs
TOTAL	Rs.	506 lakhs
Add 3% for contingencies	Rs.	15 lakhs
TOTAL	Rs.	521 lakhs
Add 1% for workcharged establishment	Rs.	5 lakhs
TOTAL	Rs.	526 lakhs

9.62. The Committee felt that for a trade of 3.5 lakh tons by the end of the Third Five Year Plan, as forecast by them, there would not be economic justifications for developing Porbandar into an all-weather port. As bulk of the expected increase in traffic is in valuable commodities like cement and soda ash, it may be economical to convert this port into an all-weather port when there are indications of its rising to about 5.0 lakh tons per year.

Immediate port development

9.63. Based on the Committee's forecast of 3.5 lakh tons of trade by the end of the Third Five Year Plan, the Committee considers that works consisting of the construction of a lighterage wharf 985 ft. in length, the provision of a mobile wharf crane, the construction of a road to the new wharf, the provision of heavy lift arrangements and an additional lighterage capacity of 100 tons, the extension of the port yard lighting and the provision of water supply to the new site estimated at about Rs. 19 lakhs should be given first priority. The provision for a railway siding in the newly developed sites, the construction of essential staff quarters and the provision of additional lighterage capacity at Porbandar estimated to cost Rs. 11 lakhs, may also be provided in the next phase of development. The detailed break up of the works recommended under First and Second priorities are given in Appendix X attached to this report.

THE PORT OF OKHA

General

9.64. Port of Okha endowed with natural features for the making of a good harbour is situated at the mouth of the Gulf of Kutch on the north-westward tip of the Saurashtra Peninsula. Okha is the most important intermediate port of the new Gujarat State. It is one of the two intermediate ports in India where steamers drawing upto 27 ft. draft can be worked alongside. It is also an all-weather port opened throughout the year. The existing port facilities at Port Okha are listed in Appendix VII. Drawing No. IPDC/26 shows the layout of the existing port of Okha along with a location plan as inset.

Traffic pattern

9.65. In 1950-51 Okha handled a traffic of 3,68,000 tons which registered a sharp rise to 4,88,000 tons by the following year, this being the maximum ever handled at Port Okha. From 1952-53 to 1957-58, the traffic was fairly steady at about 4,25,000 tons. By 1958-59, the traffic fell to 3,78,290 tons. An analysis of the traffic for the year 1958-59 shows that the import trade for that year was 1,55,958 tons and export trade 2,23,232 tons. Out of the total traffic handled at Port Okha during 1958-59, the steamer traffic was 3,63,567 tons being 93.2 per cent of the total trade and the sailing vessel traffic was 15,650 tons. Foreign trade handled at this port during that year was 66,597 tons being 17.6 per cent of the total trade. The main articles of traffic at Port Okha consists of the imports of mineral oils, machinery, iron and steel, bitumen and gunnies and the export of bauxite, cement, chemicals, mineral oils and salt. The A.C.C. cement factory situated at Dwarka 18 miles distant from Okha Port and the Tata Chemical Factory at Mithapur 8 miles distant, contribute largely to the cement and chemical traffic at Port Okha. Okha is also a distribution centre for petroleum products. The import of mineral oils through Port Okha during 1958-59 accounted for 33 per cent of the total trade of the port and cement accounted for 18.5 per cent of the total trade. The volume of traffic handled at Port Okha from 1950-51 to 1959-60 differentiating between imports and exports and sailing craft and steamer traffic is given in Appendix VIII. The number and nett registered tonnage of sailing vessels and steamers which visited Okha during the same period are given in Appendix IX.

Future traffic

9.66. The State Government forecast a traffic of 7 lakh tons at Port Okha by 1969-70 as per details given below:—

1	2	3	4
Sl. No.	Commodities	Traffic in 1957-58	Traffic by 1968-69
	Exports	Tons	Tons
1.	Mineral oil	8,630	20,000
2.	Cement	1,58,296	2,40,000
3.	Chemicals	33,380	66,000
4.	Bauxite	2,204	15,000
5.	Machinery	752	1,000
6.	Iron and steel	13,000	2,000
7.	Other general cargo	5,500	7,000
8.	Other ores	..	10,000
	TOTAL	2,10,000	3,61,000

1	2	3	4
	Imports	Rs.	Rs.
1.	Mineral oil	1,69,630	2,55,000
2.	Dates	188	750
3.	Chemicals	724	2,000
4.	Machinery	11,623	20,000
5.	Iron and Steel	5,227	2,000
6.	Other general cargo	43,103	60,000
	TOTAL . .	2,30,478	3,39,750
	Total of imports and exports :— . . .		7,00,750 Tons
		or say:	7 lakh tons.

9.67. The Committee found from their discussions with the oil companies that the future pattern of oil traffic may change. It may reduce substantially if a new refinery is located in the interior to refine oil that may be found in the Cambay region for which investigations are at present afoot. The Committee, however, felt that it would take anything from 6 to 7 years before oil can be actually exploited and obtained for commercial use from the Cambay region. An analysis of the oil traffic since 1948-49 at Port Okha shows that it rose from 1,08,000 in 1948-49 to 1,98,000 in 1954-55. Thereafter, oil traffic declined at Port Okha to 1,25,000 tons in 1958-59. This is due to a partial diversion of the oil traffic to Kandla Port. In the light of the above, the Committee feels that it is reasonable to expect an oil traffic of about 2 lakh tons per annum assuming an increase of 10 per cent per annum for the next six years or till such a time that oil is obtained from the Cambay region. The analysis of traffic in chemicals manufactured by the chemical factory at Mithapur indicates that about 60 per cent of the products go by the sea route and 40 per cent by the all-rail route to Bombay, Madras, Calcutta and Cochin. The transportation charges per ton on soda ash and caustic soda, the principal commodities manufactured at Mithapur, to different port towns by the all-rail route and the sea route as given by Messrs. Tata Chemicals are given in Appendix XXII. The chemical factory is at present being expanded to give an annual out-put of 1,70,000 tons. Assuming the same percentage of sea borne traffic in chemicals as at present, the traffic in chemicals through Port Okha may amount to one lakh tons by 1970-71.

9.68. The production of cement by the cement factory at Dwarka is roughly 2·5 lakh tons per annum out of which 1·5 to 1·8 lakh tons pass through Okha Port for coastal distribution. The capacity of the cement plant is proposed to be increased by another one lakh tons, by the Third Five Year Plan. The Committee, therefore, considers a traffic in cement of the order of 2 lakh tons per annum through Port Okha as reasonable. In the light of the above discussion, the Committee considers a total traffic of 6 lakh tons reasonable for Port Okha during the next 10 years

as per details given below, but this is subject to the condition that the oil traffic of 2 lakh tons at Port Okha will be maintained during this period.

1	2	3	4
Sl. No.	Commodity	Expected tonnage	Remarks
1.	Mineral oil	2 lakh tons	This traffic will last only up to the time till the Cambay oil is exploited for commercial use.
2.	Chemicals	1 lakh ton	
3.	Cement	2 lakh tons	
4.	Bauxite	15,000 tons	
5.	Miscellaneous cargo	85,000 tons	
	TOTAL	6 lakh tons.	

Engineering features

9.69. Port Okha is a good natural harbour sheltered by Samiani and Beyt Islands on the east and on the north and the main land on the south and the west. The main entrance to the approach channel which is narrow and only about 200 ft. in width commences near the north-east end of Samiani Island. The approach channel from this entrance to the pier is about 5000 ft. in length and 350 ft. in width, the minimum depth available being 21 ft. at L.W.O.S.T. Across the channel through the gap between Samiani Island and the main land, strong tidal currents which is locally known as "bottleneck" tidal currents with intensity of upto 5 knots at springs are experienced. A cross current with stiff west-north-west wind will make the passage of steamers through this approach channel tricky. At high and low tide, however, there is no cross current and consequently there are at least two periods during day light hours when the channel can be safely used by steamers.

9.70. Tidal particulars for Okha Port are given below: Mean high water springs - 11.6 ft. Mean high water neap - 6.0 ft. Mean low water springs - 1.8 ft. Mean low water neaps - 1.21 ft. A group of shallow patches exists towards the north-east of the pier, the nearest shoal being about 800 ft. clear from the pier. These shoals are in the nature of only a nuisance and do not really hinder safe navigation.

9.71. There is a creep of sand outwards from the shore which threatens to invade the pier and reduce the depth of water alongside. The cause of this accretion is an abutment of the pier which projects into the fore shore between the high and low water marks. This accretion needs regular observation and study.

9.72. Soundings carried out in the harbour in 1950 and 1953 indicate very little change. The approach channel to the harbour basin at Okha was dredged in 1949 by the Indian Naval Dredger "Catchalot". After about 6 years the silting in the approach channel of the harbour was of the order of 2 to 3 ft. Recently a small grab dredger has been brought to carry-out certain capital dredging along the newly built lighter wharf and also on the western side of the pier for taking a second ship alongside. The dredged material is disposed of in the sea off Samiani Island.

9.73. Borings carried out in the harbour in 1937 in connection with certain proposals for dredging indicate the material to be dredged to be sand, fine and coarse mixed with shells. Other borings carried out at the site of the second pier, proposed several years ago, approximately at the same position as the oil berth, proposed herein after by the Committee, indicate the bed to consist of sand and clay up to a depth of about 55 ft. followed by hard sand stone.

Port development

9.71. The Committee is of the opinion that it is important to segregate oil traffic from general cargo traffic at Port Okha. To handle oil traffic and general cargo traffic on the same pier is highly undesirable. The Committee have also noted that according to some old agreement which the old State of Baroda had made with an Oil Company, this Company gets preference in the use of the pier with the result that as their tankers visit the port, steamers discharging general cargo have to be removed from the pier to make room for the tanker. The Committee have also felt that it would take some years to exploit the oil from the Cambay region for commercial use. In the meantime, a tanker berth should be provided at Okha at the position shown in Drawing No. IPDC/26. This tanker berth in the event of oil traffic disappearing at Port Okha as a result of the exploitation of the oil from the Cambay region, can be converted with additional construction to a general cargo berth. The Committee also feels that the transit accommodation at Okha should be increased by 40,000 s.ft. The passenger jetty at Okha from which passengers proceed to and from Beyt Island, should be extended to enable passenger launches to come alongside during all stages of the tide. The total estimated cost of these works which should be given first priority for Port Okha is Rs. 21.5 lakhs as per details given in Appendix X.

9.75. Regarding traffic movements inside the port, the Committee observed that the location of the port railway station is too close to the port with the result that the port siding is being used by the Railways for their own shuntings. When this happens, the port traffic is dislocated. It was considered necessary to provide suitable sorting lines but this, it was felt, should be provided by the Railways. The Committee was also informed that all wagons movements inside the port are carried out by the port and that the port at present did not possess sufficient number of shunting locomotives. The Committee felt that it would be advantageous to go in for a second-hand shunting locomotive from the railways. The Committee also recommends that the railway authorities be requested to shift their port station some distance away to provide sorting lines between the new station and the port railway lines.

9.76. The existing warehousing space at Okha is 1,60,000 s.ft. The Committee felt that with the expected traffic of cement and chemicals, the storage area should be increased by an additional 72,000 s.ft. Before embarking on this scheme, however, consideration may be given by the port authorities whether the provision of the storage area required by various manufacturers should be made their own responsibility, in which case port land may be given on lease for this purpose.

9.77. At present the port has two swinging moorings. The Committee felt that it would be advantageous to convert these swinging moorings to fixed fore and aft moorings. The swinging moorings occupy considerable space and by providing fixed moorings, additional harbour space will be made available for manoeuvring as well as for additional mooring berths as and when found necessary. The question of further expansion of the port workshop at Okha was studied by the Committee. The port has already a workshop with most of the machine tools and equipment required for carrying out repairs to port craft and equipment. For the present it was felt that the provision of an electric welding set and two air compressors with necessary tools and equipment alone may be provided for repair work near the new slipway now under construction.

9.78. The need for additional stacking area for bauxite, a new trade which is being developed at Okha was stressed to the Committee. This involves certain reclaimation and levelling at a suitable site. The Committee felt that this work would be necessary. The Committee also agreed to the replacement of the existing rails in the port yard by 51 lbs. rails as per railway standards and to provide better lighting arrangements in the dock-yard.

9.79. The Committee felt that works costing Rs. 18.2 lakhs as discussed above should be given second priority for Port Okha. The break-up of the estimated costs of these works is given in Appendix X.

9.80. Various complaints received from Steamer Agents regarding communications between ships at sea and Port Okha were brought to the notice of the Committee. The need for radio communications between the port and ships at sea coming to Port Okha was thought to be essential but the Posts and Telegraphs Department should be requested to provide this facility. The port may provide this facility only if the P & T Department cannot be pursuaded upon to do this.

9.81. The Committee noted that the State Government is proposing to construct during the Second Plan a coaster berth on the shore on the western side of the pier. The Committee feels that this scheme is unnecessary and even harmful and therefore recommends that this should be abandoned. The Committee gave consideration to whether the existing pier which is insufficient in length and width for working two steamers satisfactorily one on each side should be lengthened and widened. The representative of the State Government, however, felt that the extention north-ward will not be desirable as this area is more exposed. In view of the objections of the representative of the State Government, the Committee does not wish to give further consideration to the proposal for widening and lengthening the jetty, except to point out that lengthening would provide better securing and discharging arrangements for a vessel alongside.

The Port of Sikka

General

9.82. The Port of Sikka which is at present a minor port, is located on the Gulf of Kutch 40 miles from Okha and 18 miles from the mouth of Bedi Creek coastwise. It is a fine natural harbour, well sheltered with 12 ft. of water at the anchorage at low water roughly 2¼ miles from the shore. This port was examined in detail by the West Coast Major Port Development Committee, with a view to develop it into a major port. That Committee found two handicaps in its development; first, the distance from low water to dry land is more than 5 miles which had to be reclaimed, the maximum height of reclamation being 30 ft. and the average 13 ft. Secondly from the point of view of rail leads Sikka could not compare favourably with Kandla. In view of these, the West Coast Major Port Development Committee discarded Sikka as a possible site for a major port and selected Kandla. The existing port facilities at Sikka are listed in Appendix VII attached to this report. Drawing No. IPDC/27 shows the layout of the present port.

Traffic pattern

9.83. The importance of Sikka is from the point of view of cement export. Though Sikka is only 12 miles from the intermediate port of Bedi and is connected by a metregauge line and a road to Bedi, the cement factory located at Sikka which has a production capacity of 4.3 lakh tons per annum, finds it convenient to ship cement direct from Sikka. The cement is transported direct from the factory by an aerial ropeway 12,000 ft. in length, terminating in a low water jetty, the bed alongside being at chart datum. The cement is then loaded into lighters with the help of conveyors, transported to the anchorage and shipped to Indian and foreign ports.

9.84. A study of the traffic at Sikka indicates that the traffic steadily rose from 30,948 tons in 1949-50 to 1,73,060 tons by 1957-58. In 1958-59, the traffic stood at 1,62,260 tons. An analysis of the traffic for 1958-59 indicates that the imports were 2,879 tons and exports 1,59,391 tons out of which cement accounted for 1,59,290 tons. Foreign trade during that year amounted to 59,540 tons being mainly of cement traffic amounting to 36.7 per cent of the total trade. Steamer traffic was 1,58,936 tons, being 96 per cent of the total trade of the port. Other commodities handled at Sikka during 1958-59 included the imports of gunnies (305 tons), iron and steel (119 tons), lubricating oil (29 tons), building material (99 tons) and timber (41 tons) and exports of general cargo (101 tons). The tonnage of traffic handled at Sikka per annum from 1950-51 to 1959-60 is given in Appendix VIII. The number and nett registered tonnage of steamers and sailing craft which visited the port during this period are given in Appendix IX.

Future traffic

9.85. The capacity of the cement factory at Sikka is proposed to be increased to 6.2 lakh tons per annum. Assuming the same percentage of the cement production as at present, namely 50 per cent, to go by sea route, the future traffic in cement will be of the order of 3.1 lakh tons. Miscellaneous other cargo in gunnies, iron and steel and bauxite may

be of the order of 40,000 tons per annum. The Committee on this basis visualises a future traffic of 3.5 lakh tons per annum at Sikka in the next 10 years.

Engineering features

9.86. Sikka is a good natural harbour on the Gulf of Kutch with a sheltered anchorage in a depth of 7 fathoms. The harbour is formed by the shelter afforded by Goose Reef, Seri Reef and Dera Reef over which the waves of the south-west monsoon break heavily and thus dissipate their energy. The channels inside the harbour are fringed with rocks and dead coral covered over with soft mud and sand. Comparison of past hydrographic surveys indicate little or no change.

9.87. The tidal particulars at Sikka are: mean low water springs +0.50 ft., mean high water springs +25.50 ft., mean low water neaps +7.50 ft., mean high water neaps +13.50 ft., mean sea level +10.5 ft.

Port development

9.88. The main demand of the owners of the cement factory at Sikka is that they should be able to utilise their ropeway to its full capacity. The present capacity of the ropeway is 60 to 70 tons per hour which they propose to double in the future. To enable them to do so, they desire to have an alongside berth and to extend the ropeway to it. The operation of a deep sea port at Sikka would be costly as the port would then require tugs and pilotage facilities. The Committee felt that for handling a traffic of 3.5 lakh tons, an alongside berth will not be economical. This traffic could be more economically handled in a lighterage port, especially because the lighters can be worked for at least 16 hours a day almost throughout the year due to the large tidal range obtaining at Sikka. The Committee also felt that in the event of an alongside deep draft port becoming necessary at this place for traffic other than cement from the present factory the site for such a berth should be the creek between Goose Reef and Dera Reef, which is different from the creek to which the existing ropeway for the cement factory is connected. This creek recommended for future development is wider and deeper than the one with which the ropeway is connected. The development of this creek will require substantial reclamation both for alongside facilities and for road and rail approaches.

9.89. It was brought to the notice of the Committee that the cement Factory had approached the State Government for taking over the entire lighterage work at Sikka now being performed by the Company and the State Government representative recommended this proposal. The Committee felt that the monopoly of the port by a single user, as at present, would not be desirable and therefore accepted the State Government's proposal to provide a lighterage capacity of 600 tons along with a suitable towing tug. The Committee, however, felt that this capacity may not be sufficient to obtain a shipping rate of 1,500 to 2,000 tons a day but was assured that the State Government was in a position to divert tugs and lighters from other ports if the need for the same arose. The cost of providing a shallow draft twin screw tug and a lighterage capacity of 600 tons is estimated to be Rs. 8 lakhs as per details given in Appendix X. This proposal should be given first priority for Sikka.

9.90. The State Government is anxious to provide an independent lighterage wharf to be owned by the port. As however, there is at present no cargo other than the cement for which the Cement Companies themselves have a wharf and a ropeway terminal no new lighterage wharf need be provided immediately at Sikka. If in the future there is any possibility of additional traffic other than cement, the State Government should construct a lighterage wharf at a suitable site.

9.91. In view of the steady traffic of over one lakh tons per annum being handled at Sikka the Committee recommends that Sikka should be treated as an intermediate port.

The Port of Bedi

General

9.92. The Port of Bedi, a well equipped lighterage port on the Gulf of Kutch, is an important intermediate port of the new Gujerat region. It is situated near the head of the Bedi Creek on reclaimed ground roughly 4 miles from the Gulf of Kutch and 6 miles from the city of Jamnagar. The port is open to traffic throughout the year, but at low tides, the port is dry thereby restricting the movement of lighters and country craft. These Vessels approach the port at high tides both during the day and night and lie a ground on 2 ft. of soft mud overlying a hard stratum during low tide periods. The existing layout of Bedi Port and the plan of Bedi Creek are given in Drawing No. IPDC/28. The port facilities at Bedi Port are listed in Appendix VII.

Traffic pattern

9.93. In 1950-51, the Port of Bedi handled a traffic of 1,69,792 tons. The traffic showed a steady increase and by 1958-59 reached a figure of 3,61,719 tons. An analysis of the traffic during 1958-59 indicates that imports and exports amounted to 36,495 tons and 3,25,253 tons respectively. Out of the total tonnage of exports, salt had the major share of 2,12,507 tons. Foreign trade handled at the port during 1958-59 was 2,55,454 tons being 70.6 per cent. of the total trade. Steamer traffic amounted to 3,26,604 tons, being 90.3 per cent. of the total trade, and the remaining 35,144 tons was sailing vessels traffic. The main articles of traffic at Bedi during 1958-59 were the imports of building materials (4,303 tons), coconuts (3,608 tons), cotton seeds (4,106 tons), dates (4,115 tons), fuel oil (50 tons), iron and steel (513 tons), kerosine (2,626 tons), lubricating oil (497 tons), petroleum (652 tons), tea (1,954 tons), and timber (4,481 tons), and the exports of bauxite (10,961 tons), bone and bone meals (780 tons), food-grains (2,711 tons), groundnut oil (2,776 tons), oil cakes (46,058 tons), groundnut seeds (7,469 tons), onions (38 tons), wood-raw (2,453 tons), salt (2,12,507 tons), and seeds-castor (938 tons). The tonnage of imports and exports handled at Bedi Port from 1950-51 to 1959-60, differentiating between steamer and sailing vessels traffic, is given in Appendix VIII attached to this report. The number and net registered tonnage of steamers and sailing vessels which visited Bedi during this period is given in Appendix IX.

Future traffic

9.94. The existing industrial hinterland of Bedi Port which contributes to the traffic of the port consists of:

(a) 4 big salt works producing about 4,00,000 tons of salt per year of which about 50 per cent. finds outlet by the sea route.

(b) 25 ground nut oil mills

(c) One oil extraction plant.

(d) Wool cleaning houses.

(e) Woollen and Art Silk Textile mills.

(f) Pottery works.

Committee was informed that over and above these industries, 6 modern oil extraction plants are being installed at Jamnagar with a capacity estimated to be 1,50,000 tons per annum.

9.95. The State Government forecast a traffic of 7,00,000 tons per annum for Bedi Port by the end of the Third Five Year Plan as per details given below. It was estimated by the State Government that out of the 7,00,000 tons of traffic forecast by them, steamer traffic would be 6,55,000 tons and sailing vessels traffic 45,000 tons per annum.

	Commodities	Existing traffic 1958-59	Forecast
		Tons	Tons
Imports	Building materials	4,303	4,500
	Coconuts	3,608	3,600
	Cotton-seeds	4,406	4,500
	Dates	4,115	4,500
	Fuel oil	50	200
	Iron and steel	513	2,000
	Kerosene	2,626	3,000
	Lubricating oil	497	500
	Petroleum	652	700
	Tea	1,034	4,500
	Timber	4,481	4,500
	Coal	..	30,000
	Miscellaneous	10,210	15,500
	Total	36,495	78,000

Commodities	Existing traffic 1958-59	Forecast
Exports		
Bauxite	10,964	50,000
Bone and bonemeal	780	1,000
Foodgrains	2,741	2,500
Groundnut oil	2,776	30,000
Oil cakes	46,058	1,50,000
Onions	83	500
Wool (raw)	2,453	2,500
Salt	2,42,507	3,50,000
Groundnut seeds	7,469	25,000
Seeds-caster	648	500
Miscellaneous	8,774	10,000
TOTAL	3,25,253	6,22,000
Total of imports and exports	7,00,000 tons	

9.96. The Committee, however, estimated a traffic of 5.6 lakh tons per annum at Bedi Port i.e. an increase of 2,00,000 tons over the present traffic in the next 10 years as per details given below:

Traffic in 1958-59	3,60,000 tons
Increase in oil cakes and ground nut oil traffic	75,000 tons
Increase in bauxite traffic	40,000 tons
Increase in salt traffic	75,000 tons
Increase in Miscellaneous cargo	10,000 tons
TOTAL SAY	5,60,000 tons

Engineering features

9.97. Bedi Creek flows into the Gulf about one mile northward of the northern end of Rozy Island. The entrance of this creek is marked by a small white masonry beacons, the southern most of which stands on the head of a stone jetty extending north-north-westward for about ¾ of a mile from the shore. This jetty was previously used as a landing place for passenger traffic and has since fallen into disuse. The bed of the Bedi Creek dries anything from 1 to 8 ft. above low water. The tidal particulars at Bedi are:

High water ordinary spring tides	+15·5′
High water ordinary neap tides	+12·0′
Low water ordinary neap tides	+3·0′
Low water ordinary spring tides	+0.0′

Port development

9.98 At present there is considerable delay in sailing craft and lighters reaching Bedi Port from the sea due to the fact that the bed of the creek dries several feet above low water. The dock also is dry at low water. It is, therefore, necessary to dredge this creek as a first stage to + 1 at the dock end of the creek and 0.00 at the sea end. This will give additional time for the craft negotiating the creek. In the Committee's view this work and the provision of a 350 H.P. towing tug estimated to cost Rs. 12 lakhs in all as per details given in Appendix X should be given first priority. This would enable a better turn round for the lighters thus increasing the capacity of the port. The Committee also considers certain other items of work necessary for Bedi Port. These works are the extension of the railway siding to the new wharf which was constructed during the Second Five Year Plan, the improvement to dockyard roads including new roads to the newly developed sites, addition to the existing strength of lighters by 800 tons capacity, replacement of a towing tug which is unserviceable by a tug of 350 H.P. and lighting arrangements in the newly developed area in the labour colony. These works are estimated to cost Rs. 15.8 lakhs as per details given in Appendix X and may be given second priority.

CHAPTER X

ALLOCATION OF PRIORITIES AMONGST DIFFERENT PORTS

10.1. According to the first term of reference given to the Committee, the Committee has been asked to select suitable intermediate ports in India for intensive development *in order of priority* taking into account:

(a) broad national considerations as well as regional requirements;

(b) engineering aspects with emphasis on economy of construction and maintenance; and

(c) traffic potential of the hinterland and transport costs.

10.2. The Committee having considered all the intermediate ports in India and such of the minor ports which appear to have a case for development as intermediate ports as listed in paragraph 1.8. felt that the order of priority of works on an all India basis should be as given below. The Committee is of the opinion that all works in each priority group are of equal importance. The order of listing of the ports in each priority group is based on the geographical order commencing from Paradip, the northern most port visited by the Committee on the east coast and ending with Bedi in the Gulf of Kutch on the west coast. The order of listing, therefore, is meant neither to indicate comparative priorities in a group nor the comparative importance of the ports.

First priority

10.3. The Committe recommends the following amounts as per details given in Appendix X for intensive development of intermediate ports inclusive of those minor ports recommended to be developed as intermediate ports:

State	Port	Amount Rs. in lakhs
Orissa . . .	Paradip	99·00
Andhra Pradesh .	Kakinanda	25·00
	Masulipatnam	17·00
Madras . . .	Cuddalore	50·00
	Nagapattinam.	10·00
	Tuticorin	27·00
Kerala . . .	Neendakara	92·50
	Beypore.	14·56
	Kozhikode	10·00
	General	20·00

State	Port	Amount Rs. in lakhs
Mysore	Mangalore	28·00
	Karwar	25·00
	General	10·00
Bombay (Maharashtra)	Redi	10·00
	Ratnagiri	15·40
	General	12·00
Bombay (Gujerat)	Surat	12·10
	Broach	12·60
	Bhavnagar	36·80
	Veraval	15·50
	Porbandar	19·00
	Okha	24·50
	Sikka	8·00
	Bedi	12·00
	General	15·00
	TOTAL	620·96
	or say Rs.	621 lakhs.

Second priority

10.1. All works given "Second Priority" at each port as per details given in Appendix X should be given Second priority on an all India basis. An abstract showing portwise break-up of cost is given below:

State	Port	Amount Rs. in lakhs
Orissa	Paradip	55·30
Andhra Pradesh	Kakinada	9·00
	Masulipatnam	14·80
Madras	Cuddalore	28·40
	Nagapattinam	12·15
	Tuticorin	9·50
Kerala	Beypore	10·78
	Kozhikode	4·50
Mysore	Karwar	161·40
Bombay (Maharashtra)	Ratnagiri	2·00

State	Port	Amount Rs. in lakhs
Bombay (Gujerat)	Broach	1·75
	Bhavnagar	40·25
	Veraval	26·50
	Porbandar	11·00
	Okha	18·20
	Bedi	15·80
	TOTAL	421·33
	or say Rs.	422 lakhs

Out of this Rs. 152 lakhs are meant for providing one all-weather deep draft port at Karwar which depends upon dredging experiments to be performed, showing that maintenance dredging will not be uneconomical.

Third priority

10.5. The following works may be given 3rd priority as per details given in Appendix X.

Cuddalore	Rs. 23·00 lakhs
Nagapattinam	Rs. 7·00 lakhs
Bhavnagar	Rs. 12·50 lakhs
TOTAL	Rs. 42·50 lakhs

10.6. The Committee recommends the following priorities for development of all-weather deep-draft ports:

Projects	Estimated amount Rs. in lakhs	Remarks
First priority		
Development of a 30 ft. harbour at Tuticorin with four alongside berths, 2 for coal, 1 for salt, and 1 for general cargo.	1,027	
Development of a 34 ft. harbour at Mangalore with three alongside berths, 2 for general cargo, and one for iron ore with a fully mechanised ore loading plant.	1,270	This depends on further studies showing that the port would be suitable for not less than 34 ft. draft and urgency of requirements in respect of export of iron ore.
Second priority		
Development of Paradip into an all-weather port with one mechanical ore loading berth and 4 all-weather moorings.	954	This depends on traffic exceeding 5 lakhs tons and the construction of Cuttack Paradip railway line.
Development of Porbandar into an all-weather port with two moorings.	525	This depends on traffic reaching 5 lakh tons.

CHAPTER XI

General

11.1. The Committee in the course of their study of the various intermediate ports of India, came across certain important problems relating to these ports which though not strictly within the terms of reference of the Committee, they felt should nevertheless be commented upon.

The dredging of the intermediate and minor ports of India. Outer harbour dredging

11.2. The Committee noted that in accordance with the recommendations of the Dredging Committee of the National Harbour Board, a Dredger Pool comprising of two sea going cutter suction dredgers together with the necessary pipelines and ancillary craft, is being constituted under the Ministry of Transport and Communications during the Second Five Year Plan. This dredger pool is intended mainly for the dredging of the sea approaches to the various intermediate and minor ports of India and will form the nucleus of a dredger service for the efficient maintenance of the sea approaches of these ports.

11.3. The Committee during their visits to the various ports, made a general study of the dredging needs of these ports. The Committee felt that considering the magnitude of the problem involved, the dredger pool recommended as a nucleus by the Dredging Committee should be enlarged as early as possible. In the opinion of the Committee, the enlargement of the dredger fleet should not only take into consideration the quantum of dredging involved, but also the differing marine conditions, dredging seasons and nature of the bed to be dredged at the various ports. Any one particular type of dredger may not be able to cater for the differing needs and situations at the various ports. The dredger pool should, therefore, have suitable dredgers for the needs and conditions as stated above.

Internal Dredging

11.4. The Committee noted that the Dredging Committee had recommended that the internal dredging at the various ports should be carried out by smaller units stationed at the ports themselves under the control of the respective maritime States. The Committee having studied this question still further, recommends that suitable dredging units for carrying out internal dredging at the minor and intermediate ports should be obtained by maritime State Governments for operation in each State. The Committee has recommended purchase of suitable dredgers for the maritime States requiring them as per Appendix X. This should be given first priority on an all India basis along with the other development works at each port which have been recommended to be given first priority.

Appreciation

11.5. The Committee is greatly indebted to the Chief Ministers, Ministers in charge of ports and the officers of the maritime State Governments, the Poona Research Station, the Railway Board and the various Railway Administrations, and the State Trading Corporation of India for the valuable advice, assistance and co-operation rendered by them in the work of the Committee. The Committee also wishes to thank all the non-officials, chambers of commerce, shipping and trade interests etc. who readily gave their help, co-operation, information and material required by the Committee.

11.6. The Committee also wishes to place on record its great appreciation of the industry and zeal put in by Shri I. G. Chacko, Member Secretary, in preparing this report in a remarkably short time. He voluntarily undertook this onerous task in addition to his normally heavy responsibilities as Officer on Special Duty (Minor Ports) in the Ministry of Transport and Communications.

11.7. The Committee similarly wishes to place on record its great appreciation of the excellent work done by Shri D. P. Ohri, Assistant Secretary, in organising and managing the office of the Committee and arranging tours to visit the ports in the country and the State capitals of the maritime States.

11.8. Further the Committee acknowledges with thanks the assistance received from its staff and from Shri K. S. Krishnan, Executive Engineer, Ministry of Transport and Communications and his staff in the preparation of the drawings and estimates accompanying this report.

CHAPTER XII

Summary and Recommendations

Recommendations numbers		Paragraph numbers
	PARADIP PORT	
1	*See* Recommendation after 55 which will become Recommendation No. 1.	
2	The present lines of communications and modes of transport of iron ore from the mines to the port, are not satisfactory. If these are improved Paradip will become the natural outlet of the mines in the Tomka-Sukinda region. With this improvement there will be no difficulty in moving 5,00,000 tons of iron ore to Paradip Port even without a railway line from Cuttack to Paradip	3·8 and 3·9
3	Paradip Port should be developed as a fair weather lighterage port for handling 5·5 lakh tons of traffic per annum	3·10
4	When the traffic at Paradip reaches a figure of 5·5 lakh tons per annum, it may be necessary to provide an all-weather port at Paradip together with a railway link from Cuttack to Paradip. Rourkela-Talcher line when it comes will help the development of Orissa State and the port, but this need not be an essential pre-requisite for making Paradip into an all weather port	3·11
5	At Paradip when the traffic exceeds 5·5 lakh tons per annum the Committee recommends the all-weather port to be located in Attarbanki creek lying to the south of the Mahanadi creek with entrance works on the Vizagapatnam model	3·18
6	For handling a traffic of 2·5 lakh tons, the Committee recommends works costing Rs. 99 lakhs to be given first priority as per details given in Appendix X	3·22
7	As the traffic increases upto 2·5 lakhs tons and there is indication that the anticipated traffic of 5·5 lakh tons will actually be achieved, the Committee recommends certain additional works costing Rs. 55·3 lakhs as per details given in Appendix X. This may be given second priority	3·23

Recommendations numbers	Paragrrph numbers
KAKINADA PORT	
8 Considering the importance of Kakinada, this port should be modernised and improved to handle efficiently an annual traffic of 4 lakh tons of cargo expected in the next few years. The works which are immediately required at Kakinada are estimated to cost Rs. 25 lakhs as per details in Appendix X. These should be given first priority. Certain additional works estimated to cost Rs. 9 lakhs as per details given in Appendix X are also necessary though this may be given a second priority . . .	4·14 and 4·18
MASULIPATNAM PORT	
9 A traffic of 4 lakh tons per annumn is expected in the next few years. One of the most important development required at Masulipatnam for this purpose is the stabilisation and improvement of the bar at Masulipatnam. This work estimated to cost Rs. 17 lakhs should be given first priority. Initially a sea going cutter suction dredger from the proposed dredger pool in the Ministry of Transport and Communications should be utilised for dredging the bar and thus gain experience of the quantum of maintenance dredging is involved. After actual experience of dredging with the help of dredger pool the question of a full time dredger for the port may be examined. Certain additional works estimated to cost Rs. 14·8 lakhs as per details given in Appendix X are also necessary for the development of Masulipatnam Port. though this may be given second priority	4·23 and 4·29
CUDDALORE PORT	
10 The Committee visualises a traffic of roughly 6·5 lakh tons at Cuddalore in the course of the next 10 years. For this, Cuddalore Port should be further developed into a 9 ft. harbour. One of the first essentials for this is the stabilisation of the mouth of the rivers and the improvement of the depths over the bar. This can be achieved by the training of the two rivers and the construction of two inclined breakwaters at the mouth estimated to cost Rs. 50 lakhs as per details given in Appendix X. This proposal should be given first priority. Certain additional works which may be given second priority as per details given in Appendix X are also necessary to complete the development. These will cost Rs. 28·4 lakhs .	5·10 to 5·11
	5·19

Recommendations numbers	Paragraph numbers

NAGAPATTINAM PORT

11 The importance of Nagapattinam Port is from the point of view of an established passenger traffic with Malayan ports which is expected to continue in the future. The present bar at Nagapattinam is shallow, narrow and dangerous for the passage of lighters carrying passengers. Accidents to these lighters have been reported in the past resulting in the loss of human life. Works designed to improve the bar at Nagapattinam by the provision of a reinforced concrete pier with needle piles and mobile sand pump mounted thereon, estimated to cost Rs. 10 lakhs as per details given in Appendix X, are therefore considered necessary for Nagapattinam. This should be given first priority. In addition to this scheme certain other works will also be required to modernise the port and to enable it to handle the estimated traffic of 50,000 passengers and 50,000 tons of cargo per annumn. These works are estimated to cost Rs. 12·15 lakhs as per details given in Appendix X. These should be given second priority . 5·25 and 5·31

TUTICORIN PORT

12 The Committee estimates a traffic of one million tons per annumn at Tuticorin by the end of 1964-65. For this traffic, the Committee considers a deep-sea harbour with alongside facilities at Tuticorin necessary . . . . . 5·50 and 5·51

13 The project recommended by the Committee for the development of Tuticorin into a 30 ft. harbour with 4 alongside berths, two for coal, one for salt and one for general cargo, works out to Rs. 10·27 crores as per estimate given in Appendix XIV. In essence the scheme consists of having an island harbour in the sea connected to the shore harbour by two embankments of one mile in length to carry road and railway lines. The space between the two embankments will be available for future development of the port. An island will be reclaimed in the sea on which the dock and other port facilities will be located. A turning basin will be sited on the eastern side of the island and will be protected by two inclined breakwaters. . . . . 5·55

Recommendations numbers		Paragraph numbers
14	Pending the decision of the Government of India regarding Tuticorin's future as an all-weather port with alongside facilities, certain normal development works are immediately necessary if Tuticorin is to continue as a lighterage port even for a few years. These works are estimated to cost Rs. 27 lakhs as per details given in Appendix X and should be given first priority. Certain other works which are also considered necessary but may be given second priority are estimated to cost Rs. 9·5 lakhs as per details given in Appendix X	5·56
	A NEW INTERMEDIATE PORT AT NEENDAKARA	
15	Taking into consideration the needs of the entire region near Quilon and the traffic that originates from this region, the Committee recommends that Neendakara should be developed as an Intermediate port to cater for roughly 4 lakh tons of estimated traffic per annumn	6·14 and 6·15
16	The Port of Neendakara should be developed with wharves at Koilthotam to cater for ilmenite trade, a wharf with transit shed on the Quilon side with road and rail approaches for the trade in cashew nuts and other rail borne traffic and by widening and deepening the existing waterways from the wharves to the Neendakara bar and the stabilisation and improvement of the bar by the construction of two breakwaters. The proposal costing Rs. 92·5 lakhs may be given first priority as per details given in Appendix X.	6·19
	KOZHIKODE AND BEYPORE	
17	The traffic forecast for the ports is 4·75 lakh tons per annumn by 1967-68. On this basis it will be necessary to develop Kozhikode and Beypore Ports to deal with this traffic. For this purpose a sailing vessel wharf estimated to cost Rs. 14·56 lakhs as per details given in Appendix X, should be given first priority at Beypore. Certain other items of work estimated to cost Rs. 10·78 lakhs as per details given in Appendix X are also necessary for the development of Beypore Port but these may be given second priority. As far as Kozhikode is concerned, the Committee is of the opinion that the present method of handling cargo on the pier by the existing slow and manually operated cranes, is inefficient.	

Recommendations numbers	Paragraph numbers
It will, therefore, be necessary to provide electric cranes on both the north and south piers, estimated to cost Rs 10 lakhs as a work of first priority for Kozhikode, as per details given in Appendix X. Certain other essential works which though necessary, may be given second priority, are estimated to cost Rs. 4·5 lakhs as per details given in Appendix X. Detailed observations should also be undertaken at Beypore in respect of waves, winds, tides, rivers discharge in floods and its silt content and model studies undertaken with a view to ascertain the feasibility of development of an all-weather port Beypore in the future	6·23 5·27 6·28 6·29 6·30
MANGALORE PORT	
18 The Committee estimates a general cargo traffic of 4 to 6 lakhs tons per annum after which an all-weather deep draft port is constructed at Mangalore and a railway link is made connecting Mangalore with Hassan for a distance of 123 miles. In view of this and the need for exporting 2 to 3 million tons of iron ore and the advantageous position of Mangalore for exporting both high grade and low grade ores, the Committee considers that Mangalore should be developed as an all-weather port provided it can be made suitable for at least 34 ft. ships in the next 5 to 10 years and if possible for 38 ft. draft ships as a long term measure	7·16 7·17 and 7·50
19 The project recommended by the Committee for the development of Mangalore into a 34 ft. harbour with three alongside berths, two for general cargo, and one for ore the last fully mechanised capable of handling 6 lakh tons of general cargo and 2 million tons of iron ore in the first stage is estimated to cost Rs 12·7 crores as per details given in Appendix XXV. In essence the scheme consists of having a lagoon harbour in the estuary of the Gurpur River after diverting the Gurpur and the Netravati rivers with the approach channel dredged through the sand spit to the sea and protected by two curved breakwaters. The berths will be developed on the sand spit with the railway and road lines taken across the Gurpur	

Recommendations numbers		Paragraph numbers
	estuary over the Nerravati Bund. The scheme should be taken in hand only after investigations are carried out for a 34 ft. harbour	7·51 and 7·53
20	Pending the decision of the Government of India regarding Mangalore's future as an all-weather port with alongside facilities, certain normal development works are necessary even if Mangalore has to continue as a lighterage port for a few years. These works, the details of which are given in Appendix X are estimated to cost Rs. 28·00 lakhs and should be given first priority	7·54
21	The economics of developing an all-weather port at Mangalore for 34 ft. draft steamers capable of handling 2·6 million tons of cargo indicate that the project will yield an annual return of about Rs. 43·00 lakhs after making reasonable allowance for depreciation and interest on capital at 4½ per cent . . .	7·55
	KARWAR PORT	
22	The present lines of communications from the mines to the port are not satisfactory. This should be improved to handle a traffic of five lakh tons of iron ore through Karwar port . . .	7·60
23	On the basis of the future traffic of 6 to 7 lakh tons per annum at Karwar which can reasonably be expected, Karwar should be developed as an efficient fair weather lighterage port for this purpose. The estimated cost of this is Rs. 25 lakhs as per details given in Appendix X, which can be given first priority. Certain other works which are also necessary are estimated to cost Rs. 9·5 lakhs as per items (*i*) to (*vii*) under Second Priority for Karwar given in Appendix X should be given Second Priority. In addition if experimental dredging is successful an alongside berth 600 to 900 ft. in length may be provided at Karwar. This is estimated to cost Rs. 152 lakhs as per items (*viii*) to (*xviii*) under Karwar in Appendix	7·64 7·67 and 7·71
24	A study of the water supply resources for port purposes near Karwar should be immediately undertaken .	7·68

Recommendations numbers		Paragraph numbers
	REDI	
25	In view of the importance of Redi Port for the export of iron ore, Redi Port should be developed as an intermediate port for handling 5 lakh tons of iron ore per annum. This development is estimated to cost Rs. 10 lakhs as per details given in Appendix X, and should be given first priorty	8·13 and 8·14
26	The Government of Bombay should take over Redi Port from the mining companies and run the port themselves	8·14
	RATNAGIRI	
27	The passenger traffic at Ratnagiri of the order of 1,00,000 persons per annumn as at present, will continue for the next 10 years. For this purpose Ratnagiri should be provided with better fair weather lighterage facilities to enable passengers to be landed at all stages of the tide. A 150 H. P. towing tug to help passenger lighters during unfavourable wind conditions when rowing as is being done at present becomes slow and inefficient, should be provided at Ratnagiri. The cost of these is estimated to be Rs. 15·4 lakhs as per details given in Appendix X and should be given first priorty. The provision of staff quarters estimated to cost Rs. 2 lakhs as per details in Appendix X is also necessary but may be given second priority	8·17 and 8·20
28	An all weather port for coastal passenger ships can be located in Mirya Bay. This is estimated to cost about Rs. 2·0 crores. This port may be constructed when the traffic justifies and financial resources permit. The harbour is so designed that it can later be made suitable for ocean going ships by extension of its breakwaters	8·18

Recommendations numbers	Paragraph numbers

SURAT

29. It is estimated that with the development of lighterage port near Surat the traffic at the place will be 1,00,000 tons. It is, therefore, recommended that a lighterage port be developed at Magdala about 8 miles down stream of Surat. This will also avoid the more difficult bars which the sailing craft have to negotiate at present between Surat and Magdala. The cost of this new port is estimated to be Rs. 12·10 lakhs as per details given in Appendix X and are considered of first priority for Surat Port. . . . . 9·8 and 9·12

BROACH

30. The State Government suggested to the Committee for its examination a proposal for an all-weather port for ocean going steamers at Dahej near the mouth of the Narmada. The Committee found the proposal for an all-weather port unsuitable because of the shallow sea bed and continuous silting at the site. Nor could the Committee find any other suitable site for a deep drafted or lighterage port in the vicinity of the Narmada estuary. The best way to improve the working of the port at Broach is to provide one or more tugs for towing the sailing craft at high water from Broach to the Gulf or *vice versa* thereby reducing the time taken by sailing craft for the distance of 32 miles from the sea to Broach from about 3 days to about one day. It will also be necessary to extend the existing reinforced concrete jetty at Broach to reduce the congestion created by the bunching of the craft all of which come at high water. The estimated cost of these proposals together with ancillary facilities estimated to cost Rs. 12·6 lakhs as per details given in Appendix X, should be given first priority . . . . . 9·20 and 9·21

31. Systematic hydrographic surveys should be carried out of the Narmada river and the channel suitably marked. Introduction of portable type of flashing beacons will further help navigation in the river during the night. Dredging may be undertaken at key shoals with the help of the State Government's dredgers earmarked for internal dredging. The provision for navigational aids for night navigation and the construction of quarters estimated to cost Rs. 1·75 lakhs as per details given in Appendix X, may be given second priority for Broach . . . . . .

Recommendations numbers	Paragraph numbers
BHAVNAGAR	
32. The traffic for purposes of present development at Bhavnagar is estimated to rise to 4 lakh tons in the next five years	9·25
33. The main problem of Bhavnagar is the silting in Bhavnagar channel leading to the port from the Gulf. Due to the lack of adequate technical data the Committee is unable to predict the future of Bhavnagar channel except to say that it would be possible to maintain the approach channel to the port for a number of years by gradually increasing the size of the Bhavnagar Channel	9·27
34. The Water Impounding Scheme now under construction at Bhavnagar requires certain additional works to make it work more efficiently. These include the provision of wing [illegible] on each side of the entrance, the provision of [illegible] to facilitate the handling of ships in the entrance and a 750 H.P. tug for manoeuvring ships. The approach channel to Bhavnagar [illegible] also be suitably marked. The estimated cost of these works is Rs. 34·4 lakhs as per details given in Appendix X. These works should be given first priority	9·31
35. In view of the fact that the transit sheds at Bhavnagar are located some distance away from the jetty, fork lift trucks should be used to improve the efficiency of handling. In the first instance 4 Nos. fork lift trucks estimated to cost Rs. 2·4 lakhs should be introduced. This should also be given first priority for Bhavnagar	9·33
36. No provision should be made for any oil berth inside the impounded dock at Bhavnagar, as it is highly undesirable to discharge dangerous oils inside the impounded dock, the gates of which can only be opened at high tide. Oil requirements for this port will have to be met from other sources. For oil bunkering purposes, if trade justifies, barge with tanks and pumps may be maintained. . . .	9·34
37. The State Government proposed the construction of 3 additional berths in the impounded dock. Looking to the traffic expected in a reasonable time, the Committee did not consider the provision of these berths	

Recommendations numbers	Paragraph numbers
an urgent necessity. To take care of possible bunching of ships that can enter the basin, it will suffice if the turning basin inside the impounded dock is increased to 1000 ft. dia,, and one mooring together with an adequate lighterage wharf is provided. It is also necessary to provide suitable office accommodation in the Concrete Jetty area as the existing office is far away in the town. This will enable better control of dock operation.—Repair facilities in terms of portable tools, air compressors, etc., may also be provided in the Concrete Jetty area. The water supply to the port should be augmented. It will also be necessary to construct quarters for essential port staff. The Committee recommends the above works estimated to cost Rs. 40·25 lakhs as per details given in Appendix X to be given second priority . .	9·36 and 9·37
38. The Ship Repairs Committee had recommended that at Bhavnagar the existing dry dock should be extended and deepened so as to take larger vessels. The Committee was of the opinion that the present dry dock located in the Steel Jetty site should not be extended as the site of this dry dock is a dying site. A new dry dock may be provided in the new port area, when funds permit.	9·38
39. In regard to the proposal for earmarking a berth for ship repair work inside the dock, the Committee has not recommended the construction of any new berth .	9·38
VERAVAL	
40. The Committee estimates a future traffic of 3 lakh tons per annum by the end of the Third Five Year Plan period. For this purpose, it will be necessary to obtain 4 electric cranes of ½ ton to 3 ton capacity and the 350 H.P. tug for towing the lighters to and from the anchorage. The warehousing accommodation at Veraval should also be increased by another 50,000 sq. ft. The total estimated cost of these works is Rs. 15·5 lakhs as per details given in Appendix X and should be given first priority for Veraval. Certain additional works estimated to cost Rs. 26·5 lakhs as per details given in Appendix X are also necessary for the efficient handling of the traffic at Veraval. These may be given second priority . .	9·42 9·47 and 9·48

Recommendations numbers		Paragraph numbers

PORBANDAR

41 The Committee expects a traffic of 3·5 lakhs tons at Porbandar by the end of the Third Five Year Plan. For handling this traffic, it is necessary to construct a lighterage wharf 685 ft. in length, provide a mobile crane and have an additional lighterage capacity of 400 tons. These together with certain ancillary works are estimated to cost Rs. 19 lakhs as per Appendix X and may be given first priority for Porbandar. Certain additional works estimated to cost Rs. 11 lakhs as per details given in Appendix X are also necessary, but these may be given second priority . . . . . 9·54 and 9·63

42 In regard to the proposal for the construction of an all-weather port, the Committee found that the provision of an all-weather port at Porbandar with two moorings will cost Rs. 5·25 crores. For a trade of 3·5 lakhs tons, there would not be economic justification for the development of Porbandar into an all-weather port. As bulk of the expected increase in traffic is in valuable commodities like cement and soda ash, it may be economical to convert this port into an all weather port when there are indications of its rising to about 5 lakhs tons per year . 9·61 and 9.62

PORT OKHA

43. The Committee expects a traffic of 6 lakh tons per annumn at Port Okha in the next 10 years subject to the conditions that oil traffic will continue as at present. There may be a change in the pattern of oil traffic when the Cambay oil is exploited for commercial use. It is important that oil traffic should be segregated from the general cargo traffic at Port Okha as early as possible. For this purpose an oil tanker berth should be provided at port Okha. In the event of oil traffic disappearing from Port Okha, this berth may be converted into general cargo berth. The provision of this oil tanker berth along with an additional transit accommodation of 40,000 S.ft., and the extension of passenger jetty to enable passenger launches to come alongside during all stages of the tide,

Recommendations numbers	Parhgraph numbers
estimated to cost Rs. 24·5 lakhs as per details given in Appendix X should be given first priority. Certain additional works required at port Okha as per details given in Appendix X may be given second priority. These are estmiated to cost Rs. 18·2 lakhs	9·67 9·68 9·74 9·75 9·76 9·77 9·78 9·79
44. The railway authorities should be requested to shift their port station some distance away and to provide sorting lines between the new station and the port railway lines	9·75
45. The need for radio communications between Port Okha and ships at sea coming to Port Okha is essential. The Posts and Telegraphs Department should be requested to provide this facility .	9·80
46. The proposal to construct a coastal berth on the eastern side of the pier should be abandoned as this scheme is unnecessary and even harmful . .	9·81
SIKKA PORT	
47. On the basis of the present traffic of over 1·5 lakh tons and the future traffic of 3·5 lakh tons per annum in the next 10 years forecast by the Committee, Sikka should be treated as an intermediate port. . .	9·91
48. The immediate necessity at Sikka is the provision of a shallow draft twin screw tug and a lighterage capacity of 600 tons. This is estimated to cost Rs. 8 lakhs as per details given in Appendix X and should be given first priority	9·89
BEDI PORT	
49. The Committee estimated a traffic of 5·6 lakh tons per annum at Bedi Port in the next 10 years. To take care of this traffic, it would be necessary to dredge Bedi Creek in the first stage aiming at a level of 4	

Recommendations numbers	Paragraph numbers
at the dock-end of the creek and 0·00 at the sea-end. It will also be necessary to provide a 350 H.P. towing tug. These works would enable a better turn round for the lighters thus increasing the capacity of the port. The estimated cost of these works is Rs. 12 lakhs as per details given in Appendix X. These should be given first priority. Certain additional works estimated to cost Rs. 15·8 lakhs as per details given in Appendix X are also necessary at Bedi port but these may be given a second priority .	9·96 9·98

PRIORITIES ON AN ALL INDIA BASIS

50.	The development works given under first priority at each port as per details given in Appendix X should be given first priority on an All India basis. These are estimated to cost Rs. 6·12 crores . .	10·3
51.	All works given second priority at each port as per details given in Appendix X should be given Second Priority. The total cost of these works is Rs. 4·22 crores .	10·4
52.	All works under Third priority as per details given in Appendix X may be given third priority. These are estimated to cost Rs. 42·50 lakhs . .	10·5
53.	The Committee recommends the following priorities for development of all-weather deep draft ports. .	10·6

Projects	Estimated amount Rs. in lakhs	Remarks
First priority		
Development of a 30ft. harbour at Tuticorin with four alongside berths, 2 for coal, 1 for salt, and 1 for general cargo.	1.027	
Development of a 34 ft. harbour at Mangalore with three alongside berths, 2 for general cargo and one for iron ore with a fully mechanised ore loading plant.	1.270	This depends on further studies showing that the port would be suitable for not less than 34 ft. draft and urgency of requirement in respect of export of iron ore.
Second priority		
Development of Paradip into an all-weather port with one mechanical ore loading berth and 4 all weather moorings.	954	This depends on traffic exceeding 5 lakhs tons and the construction of Cuttack—Paradip railway line.
Development of Porbandar into an all-weather port with two moorings.	525	This depends on traffic reaching 5 lakhs tons.

Recommendations numbers	Paragraph numbers

GENERAL

54. Considering the magnitude of the dredging needs of the various intermediate ports and minor ports, the Dredger Pool recommended as a nucleous by the Dredging Committee be enlarged as early as possible. 11·3

55. The provision of dredgers for carrying out internal dredging at the various ports as per details given in Appendix X should be given first priority on an all-India basis along with the other development works at each port which have been recommended to be given first priority . . . . . 11·4

IRON ORE EXPORTS

1. In view of the important role iron ore traffic will play in future in deciding the ports to be developed, the Committee went into the question of the future possibilities of iron ore exports from India and the ports through which these ores should be economically routed. The Committee came to the conclusion that there was a reasonable prospect of iron ore exports reaching a figure of 13 million tons per year by 1966-67 with a possible increase to 15 million tons a few years later if not by 1966-67. As it is advantageous to develop port capacity ahead of needs, the Committee considered that it would be desirable to accept the figure of 15 million tons for the purpose of planning port development. This traffic will be handled both by the major and intermediate ports. The Committee recommends that the following intermediate ports should be developed for handling the quantities of iron ore shown against them in the next 5 to 10 years . . . . . 2·3

Paradip	2·5 to 5·0 lakh tons
Kakinada	2·0 lakh tons.
Masulipatnam	3·0 lakh tons
Cuddalore	5·0 lakh tons
Mangalore	20·0 lakh tons provided this is found suitable for not less than 34 ft. draft.
Karwar	5·0 lakh tons.
Redi	5·0 lakh tons.

1. Shri H. P. Mathrani—*Chairman.*
2. Shri D. Sandilya.
3. Capt. W. B. Piggot.
4. Shri M. S. Venkataraman.
5. Shri K. Ranganathan.
6. Shri K. L. Luthra.
7. Shri P. Sawhney.
8. Dr. C. R. Krishnamoorthy. (Please see his Note of Dissent at Appendix XXVII)
9. Dr. H. B. Mohanty.
10. Shri K. N. Srinivasan.
11. Capt. C. Sankunni.
12. Capt. L. T. Yettie.
13. Shri H. P. Oza (Please see dissenting note at Appendix XXVI).
14. Capt. M. L. Advani.
15. Shri T. M. Goculdas.
16. Shri S. N. Haji.
17. Shri N. L. Kanoria.
18. Shri Ghanshyamlal Gopalji Thakur (Please see dissenting note at Appendix XXVI).
19. Shri I. G. Chacko—*Member Secretary.*

Appendix I

INTERMEDIATE PORTS DEVELOPMENT COMMITTEE

Questionnaire

1. Which ports other than Major Ports would you recommend for intensive development? Please state the order of priority which you would recommend.

2. What is the existing traffic at these ports? Please give annual figures for the last 10 years in respect of the number of ships and net registered tonnage (foreign and Coastal and steamer and country craft all separately) of shipping handled, and category-wise details of imports, exports and passenger traffic both embarking and disembarking, all separately and differentiating between coastal and foreign steamer traffic and coastal and foreign country craft traffic? Please also state the origin of traffic commodity-wise.

3. (a) What increase in traffic is expected in the next 10 years and on what basis is this increase assumed? Please give detailed figures category-wise as in 2 above indicating also the origin of traffic. If any part of such traffic is expected to be diverted from other ports, the names of these ports and the volume of traffic likely to be diverted from each should be indicated category-wise.

(b) Copies of the hinterland map showing the location of industries, towns mines, roads, I.W.T. routes and railways may please be supplied.

(c) If any traffic survey has been carried out by a competent authority, please supply copies of the report.

(d) Can a traffic forecast for the next 20 years be reasonably made for the selected ports, and what is the basis of these forecasts?

(e) What are the transport costs, commodity wise, of each mode of transport from the hinterland to the port?

(f) Is the port commercially attractive or good for residential purposes? Are medical aid, schools etc. available? What is the population of the town?

4. What are the existing facilities at the suggested ports, and what facilities are expected to be developed at these ports under the development programme already taken in hand or proposed to be taken up in the Second Five Year Plan? Please give full details (existing as well as proposed).

(a) Shore facilities (jetties, wharves, piers, transit sheds, warehouses at the port and in the town, buildings, dry docks, shipways, workshop facilities, open storage area, extent of land estate, bunders for country craft, moorings for lighters and ships separately, weigh bridges, etc.).

(b) Harbour crafts (Tugs, pilot vessels, mooring launches, general service launches, survey launches, lighters, heave-up barges for mooring buoys, fire-floats, dredgers, hopper barges, etc.).

(c) Mechanical handling and transporting facilities (cranes, locomotives, trollies, wagons, heavy lift facilities, oil handling facilities, etc.).

(d) Navigational aids for day, night and all weather: (buoys, lights, leading marks, signal stations pilotage when required; convenient place for pilots to board ships, etc.) Turning areas.

(e) Availability of trained labour for handling ore consignments.

(f) Stevedoring facilities.

(g) Electric power supply.

(h) Water supply.

(i) Road and rail approaches—Terminal facilities like marshalling yards, parking areas, etc.

(j) Marine and physical features:

(i) Survey charts.

(ii) Tides (Range at springs and neaps, tidal currents, period of slack water etc.).

(iii) Wave heights—Exposure to cyclones and monsoon etc.

(iv) Wind particulars and records—meteorological data.

(v) Salt content of water in the port area at various places and depths during different seasons of the year and different stages of the tide.

(vi) Rainfall, temperatures.

(vii) Soil and subsoil—Results of investigations.

(viii) Bars—Formation of if any; causes for—heights and material.

(ix) Details of anchorages—material—holding ground distance and depths.

(x) Length, draft and tonnage of ships now using the anchorages and approach channels.

(xi) Approach channels—currents in both ebb and flood—direction and intensity.

(xii) Dock or harbour entrance: width, depth, currents and other features.

(k) Dredging—Is this being done now? If so please give details of the dredger, quantity of annual dredging and distance to disposal grounds.

(l) Miscellaneous services available:—

(i) High pressure water supply.

(ii) Drainage.

(iii) Fire fighting services.

(iv) Ambulance.

(v) Diving and salvage facilities.

(vi) Telephones.

(m) Port control: The present system of management may be described with reference to executive powers, advisory committee attached to it, revenues, expenditures, rates, loans, allotments, grants, funds, control of finance.

Please give full information on the financial results of the working of the ports and their resources position and in particular the funds available either with the Port Authority or with the State Government which are either earmarked or are likely to be available for port development.

(n) Present set up of staff with grades.

5. What additional facilities do you consider necessary to handle the traffic expected at the end of 10 years? Please supply project plans and estimates for the works proposed, if already prepared.

6. What is the present method of handling cargo? Please indicate the normal loading or unloading rate achieved for the major commodities as well as the maximum rate achieved in the past under ideal conditions.

7. What is the present annual cargo handling capacity of the ports and what capacity is expected to be developed at these ports at the end of the Second Five Year Plan.

8. Has any engineering study of the ports been ever made? If so, copies of the past engineering reports may please be supplied.

9. What allied transport in the hinterland of the ports are considered necessary to cater for the traffic forecast for the next 10 years? What is the estimated cost of these developments? Please state whether any of the transport schemes has already been included in the Second Five Year Plan.

APPENDIX II

LIST OF ADDRESSEES TO WHOM THE QUESTIONNAIRE WAS SENT BY THE COMMITTEE

State Governments.

1. The Secretary to the Government of Bombay, Public Works Department, *Bombay*.
2. The Secretary to the Government of Madras, Public Works Department, *Madras*.
3. The Secretary to the Government of West Bengal, Home (Transport) Department, *Calcutta*.
4. The Secretary to the Government of Orissa, Political and Services Department, *Cuttack*.
5. The Secretary to the Government of Uttar Pradesh, Irrigation (Works) Department, *Lucknow*.
6. The Secretary to the Government of Assam, Transport and Commerce Department, *Shillong*.
7. The Secretary to the Government of Bihar, Labour Department, *Patna*.
8. The Secretary to the Government of Kerala, Public Works Department, *Trivandrum*.
9. The Secretary to the Government of Andhra, Public Works Department, *Hyderabad*.
10. The Chief Secretary to the Government of Mysore, *Bangalore*.
11. The Chief Secretary to the Government of Rajasthan, *Jaipur*.
12. The Chief Secretary to the Government of Madhya Pradesh, *Bhopal*.
13. The Chief Secretary to the Government of Punjab, *Chandigarh*.
14. The Chief Secretary to the Government of Jammu and Kashmir, *Srinagar*.
15. The Chief Commissioner, *Pondicherry*.
16. The Chief Commissioner, Andaman and Nicobar Islands Administration, *Port Blair*.

SHIPPING COMPANIES

17. The Scindia Steam Navigation Co. Ltd., "Scindia House", Ballard Estate, *Bombay*.
18. The India Steamship Co. Ltd., "India Steamship House", 21 Old Court House Street, *Calcutta*-1.
19. The Eastern Shipping Corporation Ltd., "Steelcrete House", Churchgate Reclamation, *Bombay*-1.
20. The Western Shipping Corporation Ltd., "Steelcrete House", Churchgate Reclamation, *Bombay*-1.

21. The Bharat Line Ltd., "Bharat House", 104, Apollo Street, Fort, *Bombay*.
22. The Bombay Steam Navigation Co. (1953) Ltd., 100, Frere Road, *Bombay*-9.
23. The Great Eastern Shipping Co. Ltd., 14, Jamshedji Tata Road, Churchgate Reclamation, *Bombay*-1.
24. The New Dholera Steamship Co. Ltd., The Bombay Mutual Building, 293, Dr. Dadabhoy Naoroji Road, *Bombay*-1.
25. The Malabar Steamship Co. Ltd., The Bombay Mutual Building, 293, Dr. Dadabhoy Naoroji Road, *Bombay*.
26. The National Steamship Co. Ltd., The Bombay Mutual Building, 293, Dr. Dadabhoy Naoroji Road, Post Box No. 34, *Bombay*.
27. The Merchants Steam Navigation Co. Ltd., 289/293 Narshi Natha Street, *Bombay*-9.
28. The Africana Co. Ltd., 289/93 Narshi Natha Street, *Bombay*-9.
29. The South East Asia Shipping Co. Ltd., "Himalaya House", Dr. Dadabhoy Naoroji Road, *Bombay*.
30. The Ambica Steam Navigation Co. Ltd., "Prospect Chamber", 315-32, Dadabhoy Naroji Road, *Bombay*.
31. The Indian National Steamship Co. Ltd., 1-B, Halwpiya Road, *Calcutta*.
32. The Hindustan Shipping Co. Ltd., 10, Canning Street, *Calcutta*-1.
33. The Gill Amin and Co. Ltd., 15, Peoples Building, Sir Pheroz Shah Mehta Road, *Bombay*.
34. The Meridian Steamship Co. Ltd., "Swastic Chambers", Carnack Bunder, *Bombay*-1.
35. The Bengal Line Ltd., Lyons Range, *Calcutta*-1.

CHAMBERS OF COMMERCE

Andhra.

36. The Krishna District Chamber of Commerce, Masulipatam (South India).
37. The Cocanada Chamber of Commerce, Kakinada.
38. Godavori Chamber of Commerce, Cocanada.
39. Indian Chamber of Commerce, Guntur.
40. Federation of Commerce and Industries, 352, Sultan Bazar, Hyderabad Deccan-1.

Assam.

41. Upper Assam Chamber of Commerce, P.O. Jorhat (Assam).

Bengal.

42. Associated Chamber of Commerce of India, Royal Exchange, *Calcutta*.
43. Bengal Chamber of Commerce and Industry, Royal Exchange, Post Box No. 280, *Calcutta*.

41. Bengal National Chamber of Commerce, Mission Row Extension, First and Second Floor, *Calcutta*-1.
45. Bharat Chamber of Commerce, 195, Harison Road, *Calcutta*.
46. Eastern Chamber of Commerce, 15, Clive Row, *Calcutta*-7.
47. Hindustan Chamber of Commerce, 14/2, Clive Row, *Calcutta*.
48. Indian Chamber of Commerce, "Indian Exchange", Royal Exchange Place Extension, *Calcutta* 1.
49. Merchants' Chamber of Commerce, 173, Harison Road, *Calcutta*.
50. The Oriental Chamber of Commerce, 6 Clive Row, *Calcutta*-1.

Bihar.

51. Bihar Chamber of Commerce, *Patna*.

Bombay.

52. Africa and Overseas Merchants' Chamber, 31, Peoples Building, 4th Floor, Phirozeshah Mehta Road, *Bombay*-1.
53. Bombay Chamber of Commerce and Industry, Mackinnon Mechenzie's Building, Ballard Estate, *Bombay*.
54. Federation of Gujrat Mills and Industries, *Baroda*.
55. Gujrat Vepari Mahamandal, 'Gujrat Samachar' Building, Kanpur, Ahmedabad.
56. Indian Merchants' Chamber, Lalji Naranji Memorial, Indian Merchants' Chamber Building, Back Bay Reclamation, Fort, *Bombay*.
57. Iron Steel and Hardware Merchants Chamber of India, K. T. Building, Broach Street, Opposite Victoria Docks, Blue Gate, *Bombay*.
58. **Maharashtra** Chamber of Commerce, 12, Rampart Row, 3rd Floor, Fort, *Bombay*-1.
59. Maharashtra Chamber of Commerce and Industries, 587/9, Shukrawar Peth, Tilak Road, *Poona*-2.
60. Poona Merchants Chamber, 185, Bhawani Peth, *Poona*-2.
61. Surat Chamber of Commerce, *Surat*.
62. Western Indian Chamber of Commerce, 232-231, Kalbadevi Road, *Bombay*.
63. The Porbandar Chamber of Commerce, Manek Chowk, *Porbandar*.
64. Berar Chamber of Commerce, Rajasthan Building, *Akola*.
65. Nagpur Chamber of Commerce Limited, New Cotton Market, *Nagpur*.
66. Nag Vidarbha Chamber of Commerce, Satya Villas, Temple Road, Civil Station, *Nagpur*-1.
67. Saurashtra Chamber of Commerce, Mahatma Gandhi Road, Lokhand Bazar, *Bhavnagar*.
68. The Chamber of Commerce DBZ/S/130-A, Gandhidham, (Kutch).
69. The All India Wool Trade Federation, Post Box No. 1051, *Bombay*.

Delhi.

70. Central Council of Refrigeration and Air Conditioning Traders Association of India, Post Box No. 563, *New Delhi.*
71. Delhi Chamber of Commerce, Delbar Building, Original Road, Paharganj, *Delhi.*
72. Federation of India Chamber of Commerce and Industry, 28, Ferozeshah Road, *New Delhi.*
73. Punjab and Delhi Chamber of Commerce, Scindia House, *New Delhi.*
74. Punjab Merchants Chamber, Saddar Bazar, *Delhi.*
75. United Chamber of Trade Association, Katra Pathi, Nai Sarak, *Delhi*-6.
76. Federation of Biscuit Manufacturers' of India, 17, Alipur Road, *Delhi*-6.
77. The Roller Flour Millers' Federation of India, Scindia House, Curzon Road, P.O. Box 24, *New Delhi*-6.
78. The Federation of Hotel and Restaurant Associations of India, Maidens' Hotel, *Delhi.*

Jammu/Kashmir.

79. The Kashmir Chamber of Commerce, Srinigar, *Kashmir.*

Kerala.

80. Chamber of Commerce, *Trichur.*
81. Indian Chamber of Commerce, Mattancherry Post, *Cochin*-2.
82. Northern Travancore Chamber of Commerce, *Alwaye.*
83. Travancore Chamber of Commerce, Alleppey, Travancore, South India.
84. Malabar Chamber of Commerce, Kozhikode.
85. North Malabar Chamber of Commerce, Cannanore, (North Malabar).
86. Calicut Chamber of Commerce, Kozhikode.
87. Cochin Chamber of Commerce, Post Box No. 16, Cochin.

Madhya Pradesh.

88. The Malwa Chamber of Commerce, 49, Sitalmata Bazar, Indore City.
89. Mahakoshal Chamber of Commerce, Jubbulpore.

Madras.

90. Andhra Chamber of Commerce, Andhra Chamber Building, 272/3, Angappa Naick Street, Madras-1.
91. Chamber of Commerce, Nagapatam.
92. Coimbatore Chamber of Commerce, Coimbatore.
93. Hindustan Chamber of Commerce, No. 168, Boradway Gujerathi Mandal Building, Madras-1.
94. Indian Chamber of Commerce, 14/75, Oppanakara Street, Coimbatore.
95. Indian Chamber of Commerce, Tuticorin.

96. Indian Leather Federation, Melvesharam (North Arcot District), Madras.
97. Indian Chamber of Commerce, for Great Britain and Commonwealth, 1/30, Mount Road, Madras.
98. Madras Chamber of Commerce, Dare House, First Lane, Beach, Madras.
99. The Madura-Ramnad Chamber of Commerce, 90-92, Avanimoola Street (2nd Floor), Madurai, Madras.
100. Salem District of Commerce, Salem.
01. Southern Indian Chamber of Commerce, Indian Chamber building, North Beach, Madras.
02. Tamil Chamber of Commerce, 119, Armenian Street, Madras-1.
03. Tuticorin Chamber of Commerce, Tuticorin.
101. The Virudhunagar Chamber of Commerce Ltd., Virudhunagar.
105. The Vijay Bharatha Chamber of Commerce Ltd., Virudhunagar Ramnad.
106. East Indian Tobacco Federation, Post Box No. 1258, 2/6, Second Lane, Madras.

Mysore.

107. Mysore Chamber of Commerce, Bangalore.
108. Manara Chamber of Commerce, P.O. Box No. 116, Bunder, Mangalore (S.K. District).
109. Karnatik Chamber of Commerce, Hubli.

Orissa.

110. Orissa Chamber of Commerce, Chandni Chowk, Cuttack.

Punjab.

111. Northern India Chamber of Commerce, Desi Beopar Mandal Ambala Cantt.
112. The Punjab Federation of Industry and Commerce, Amritsar, Inside Hall Gate, Amritsar (Punjab).

Rajasthan.

113. Jaipur Chamber of Commerce, Johari Bazar, Jaipur City.
114. Rajputana Chamber of Commerce and Industry, Johari Bazar, Jaipur City.

Uttar Pradesh.

115. Agra Merchants' Chamber Limited, Bari Kothi, Belanganj.
116. Merchants' Chamber of United Provinces, 15/23, Civil Lines, Kanpur.
117. National Chamber of Commerce, Belanganj, Agra.
118. Silk Merchants' Chamber of Commerce, Banaras.
119. United Provinces Chamber of Commerce, 15/57, Civil Lines, Kanpur.
120. Upper Indian Chamber of Commerce, Civil Lines, Kanpur.
121. Western U.P. Chamber of Commerce, Meerut.

Appendix III

(A) *List of State Governments and officials from whom replies to the Questionnaire of the Committee were received.*

Orissa :

1. The Secretary to the Government of Orissa, Political & Services (Paradip) Department, Bhubneswar.

Andhra Pradesh :

2. The Secretary to the Government of Andhra Pradesh, Public Works Department, Hyderabad.

Madras :

3. The State Port Officer, Madras.
4. The Secretary to the Government of Madras, Public Works Department, Madras.

Kerala :

5. The Secretary to the Government of Kerala, Public Works Department, Trivandrum.

Mysore :

6. The Secretary to the Government of Mysore, Public Works Department, Bangalore.

Bombay :

7. The Secretary to the Government of Bombay, Public Works Department Bombay.
8. The Executive Engineer, Okha Division, Porbandar.
9. The Executive Engineer, Bhavnagar Division, Bhavnagar.
10. The Executive Engineer, Marine Division, Bombay.

Andaman and Nicobar Islands :

11. The Chief Commissioner, Andaman and Nicobar Islands, Port Blair.

(B) *List of the Chambers of Commerce and Industries etc., from whom replies were received by the Committee to their questionnaire.*

Orissa :

1. The Orissa Chamber of Commerce and Industry, Cuttack.

Andhra Pradesh :

2. The Andhra Chamber of Commerce, Madras.

Madras :

3. The Indian Chamber of Commerce, Tuticorin.
4. M/s. Parry & Co., Ltd., Madras–1.
5. The Indian Chamber of Commerce, Madras.
6. The Virudhanagar Chamber of Commerce, Virudhanagar.
7. M/s. A. & F. Harvey, Ltd., Tuticorin.
8. The Tuticorin Chamber of Commerce, Tuticorin.
9. M/s. Madura Company (Private) Ltd., Nagapattinam.
10. The Madura-Ramnad Chamber of Commerce, Madras.
11. The Tamil Chamber of Commerce, Madras.
12. The Southern India Chamber of Commerce, Madras.

Kerala :

13. The Travancore Chamber of Commerce, Alleppey.

Mysore :

14. The Mangalore Port Trust, Mangalore.
15. The Karnatak Chamber of Commerce, Hubli.

Bombay :

16. M/s. Tata Chemicals Ltd., Bombay.
17. The Morvi Chamber of Commerce, Morvi.
18. The Saurashtra Chamber of Commerce, Bhavnagar.
19. Shri Digvijaya Cement Co. Ltd., Bombay.
20. The Indian National Steamship Owners Association, Bombay.
21. The Surat Chamber of Commerce, Surat.
22. The Indian Merchants Chamber, Bombay.
23. The Federation of Gujerat Mills and Industries, Baroda.

West Bengal :

24. The Bengal Chamber of Commerce & Industry, Calcutta.

(C) *List of persons/parties from whom Representations and Memoranda were received by the Committee.*

1. The Madura-Ramnad Chamber of Commerce, Madurai.
2. The Tuticorin Chamber of Commerce, Tuticorin.
3. The Indian Chamber of Commerce, Tuticorin.
4. The Tamil Chamber of Commerce, Madras–1.
5. The Surat Chamber of Commerce, Surat.
6. The Indian Merchants' Chamber, Bombay.
7. The All India Manufacturers' Organization, Bombay.
8. The Chief Secretary, Niral Village Development Society, Bombay.

9. Shri K. C. Mohanty, c/o. M/s. H. Naik & Co., Chartered Accountant and Auditors, Cuttack.
10. The All India Exporters Chambers, Janambhomi Chamber, Bombay.
11. The Ratnagiri Port Development Committee, Ratnagiri.
12. Dr. M. N. Birje, M.B.B.S., J. T. and Temporary Presidency Magistrate, Ex-Municipal Councillor and M.L.A., Bombay.
13. The Inhabitants of Tangasseri, Quilon.
14. The President, Gandhi Seva Sangham, Tangasseri, Quilon.
15. The Secretary, Thangasseri Casual Labours' & Non-Employees' Association, Thangasseri, Quilon.
16. Shri J. S. D. Cruz, Cheerful Lodge, Tangasseri, Quilon.
17. The Calicut Chamber of Commerce, Calicut.
18. The Malabar Chamber of Commerce, Calicut.
19. The South Indian Cashew-nut Manfg. Association, Quilon.
20. The Kerala Cashew Manfg. Association, Quilon.
21. The Quilon Merchants Association, Quilon.
22. The Port Workmens' Union, Chavara, (Quilon).
23. The West Quilon Mandal Congress Committee, Quilon.
24. The Coastal Young Men's Society, Thangasseri.
25. The Kaval Progressive Federation, Quilon.
26. The Citizens of Quilon.
27. The Chairman, Quilon Municipal Council, Quilon.
28. The Secretary, Beypore Congress Committee, Beypore.
29. The Secretary, Muslim League Committee, Beypore.
30. The Secretary, Indian National Trade Union Congress, Beypore.
31. The Secretary, Praja Socialist Party, Beypore.
32. The Cocanada Chamber of Commerce, Kakinada.
33. The Godavari Chamber of Commerce, Kakinada.
34. The Krishna District Chamber of Commerce, Kasulipatnam.
35. The Utkal Mining and Industrial Association, Bhubneswar.
36. The Orissa Chamber of Commerce and Industry, Cuttack.
37. The Andhra Pradesh Sailing Vessels Owners' Association, Masulipatnam.
38. The Masulipatnam Port Development Committee, Masulipatnam.
39. Shri Dantu Bhaskara Rao, Chairman, Municipal Council, Kakinada.
40. The Broach Merchants Association, Furja Road, Broach.
41. The Standard Vacuum Oil Company, Port Okha.
42. The President of Ranpar and nearby Villages, Ranpar Port, District Ratnagiri.
43. The Tuticorin Harbour Development Council, Tuticorin.
44. The Andhra Chamber of Commerce, Madras.

45. The Indian National Steamship Owners' Association, Bombay.
46. The Morvi Chamber of Commerce, Navlakhi.
47. The Dandeli Industries Association, Dandeli (North Kanara).
48. The Kanara Chamber of Commerce, Mangalore.
49. The Karwar Taluka Merchants' Association, Karwar (North Kanara).
50. The Southern India Chamber of Commerce, Madras.
51. The Nagapatnam Chamber of Commerce, Nagapatnam.
52. The Ranpar Port Development Committee, Ranpar.
53. The Karnatak Chamber of Commerce and Industry, Hubli.
54. The Sorath Chamber of Commerce, Veraval.
55. The Saurashtra Chamber of Commerce, Mahatma Gandhi Road, Bhavnagar.
56. The Navanagar Chamber of Commerce, Chamber Hall, Jamnagar.
57. The President, Okha Municipality, Okha.
58. The President, Okha Chamber of Commerce, Okha.
59. Shri Maldevji M. Odedra, M.L.A. (Bombay State), Porbandar.
60. The Porbandar Chamber of Commerce, Porbandar.
61. Shri Digvijay Cement Company Ltd., Sikka.
62. The Travancore Chamber of Commerce, Alleppey.
63. The Salem Distt. Chamber of Commerce, Salem.
64. The Cuddalore Boat Workers' Union, Cuddalore.
65. The Madras Chamber of Commerce, Madras.

APPENDIX IV

The itinerary of the Intermediate Ports Development Committee

2		3
Date of Tour From	To	Names of ports and places visited
-3-1959	9-3-1959	Madras, Cuddalore, Nagapattinam, and Tuticorin.
9-4-1959	8-5-1959	Karwar, Mangalore, Malp and Bangalore.
9-8-1959	25-8-1959	Ratnagiri, Ranpar, Redi and Bombay.
3-9-1959	22-9-1959	Bhubaneswar, Paradip, Kakinada, Masulipatnam and Hyderabad.
2-10-1959	27-10-1959	Surat, Magdalla, Broach and Poona.
3-11-1919	18-11-1959	Calicut, Beypore, Alleppey, Kollbottam, Neendakara, Thangasseri, Quilon and Trivandrum.
1-12-1959	22-12-1959	Jamnagar Bedi, Sikka, Okha, Mithapur, Dwarka, Porbandar, Veraval, Bhavnagar, Ahemdabad and Bombay.
4-1-1960	29-1-1960	New Delhi.
4-3-1960	18-3-1960	Hyderabad.
1-4-1960	25-4-1960	New Delhi.

APPENDIX V

List of the Gentlemen, Officials and Organisations with whom the Intermediate Ports Development Committee had discussions

1	2	3	4	5
Sl. No.	Date	Place	Name of Persons/Party	Designation
1	5-3-1959	Madras	Shri H.P. Sarma	Chief Operating Superintendent, Southern Railway, Madras.
2	5-3-1959	Do.	Shri K.G. Hingorani	Deputy Chief Operating Superintendent, Southern Railway, Madras.
3	5-3-1959	Do.	Shri E.P. Royappa	Secretary, P. W. D., Madras.
4	5-3-1959	Do.	Shri K.M. Radhakrishnan	Assistant Secretary, P. W. D Madras.
5	5-3-1959	Do.	Shri J.R. Galloway	Member, Madras Chamber of Commerce, Madras.
6	5-3-1959	Do.	Shri M.J. Edwards	Do.
7	5-3-1959	Do.	Shri A.R. Cornway	Do.
8	5-3-1959	Do.	Shri V.S.L. Nathan	Member, Tamil Chamber of Commerce, Madras.
9	5-3-1959	Do.	Shri Syed Yusuf	Do.
10	5-3-1959	Do.	Shri M.E. Venkatakrishnan	Representative Burmah Shell, Madras.
11	5-3-1959	Do.	Shri R.A.S. Swift	Do.
12	5-3-1959	Do.	Shri P.A. Saparishi	Do.
13	5-3-1959	Do.	Shri S.M. Mohandas	Representative, Standard Vacuum Oil Co., Madras.
14	5-3-1959	Do.	Shri N.S.V. Raman	Do.
15	5-3-1959	Do.	Shri Paul Victor	Representative, Caltex, Oil Co., Madras.
16	5-3-1959	Do.	Shri S. Rathnam	Do.
17	5-3-1959	Do.	Shri M. Narayana Rao.	Representative Andhra Chamber of Commerce.
18	5-3-1959	Do.	Shri P.N. Ethiraj	Do.

1	2	3	4	5
19	5-3-1959	Madras	Shri K.P. Ramamurthy	Representative Andhra Chamber of Commerce.
20	6-3-1959	Cuddalore	Shri A. Krishnaswamy Pillai	Member Mandal Congress Committee.
21	6-3-1959	Do.		Chairman and Members of the Indian Coastal Conference Steamers Agents Association.
22	6-3-1959	Cuddalore		The Cuddalore Boats Union.
23	7-3-1959	Nagapatinam		Members of the Port Advisory Board.
24	7-3-1959	Do.		President and Members of the Chamber of Commerce, Nagapatinam.
25	9-3-1959	Tuticorin		Chairman and Members of the Tuticorin Harbour Development Council.
26	9-3-1959	Do.		Representatives of the Tuticorin Port Trust.
27	30-4-1959	Karwar	Shri R.D. Shanbhag	President, Karwar Taluka Merchants Association, Karwar.
28	30-4-1959	Do.	Shrimati Subasini Barkar.	Vice-President, Karwar Municipality.
29	30-4-1959	Do.	Shri R.V. Sirur	Honorary Secretary Karnatak Chamber of Commerce, Hubli.
30	Shri R.G. Wali		Shri R.G. Wali	Member, Karnatak, Chamber of Commerce, Hubli.
31	30-4-1959	Karwar	Shri B.A. Desai	Do.
32	30-4-1959	Do.	Shri D.N. Nurigappa	Do.
33	30-4-1959	Do.	Shri G.M. Murgi	Do.
34	30-4-1959	Do.	Shri D.V. Chittal	Do.
35	30-4-1959	Do.	Shri M.V. Sirur	Do.
36	30-4-1959	Do.	Shri M.S. Bhatara	Do.
37	30-4-1959	Do.	Shri B.M. Burle	Do.
38	30-4-1959	Do.	Shri D.S. Kotari	Do.
39	30-4-1959	Do.	Shri P.S. Karanth	Do.
40	30-4-1959	Do.	Shri R. Bhatara	The Dandeli Industries Association, Dandeli.

2	3	4	5
)-4-1959	Karwar	Shri Syed Mohidin	President, District local Board, Kanara.
4-1959	Do.	Shri S.K. Pai .	Secretary, Planning and Development Sub-Committee District Congress Committee N. Kanara District.
-1959	Malpe	Dr. K.L. Aithala	Chairman, Udipi Municipal Council, Udipi.
5-1959	Do.	Shri T.A. Pai	Member, Mysore Pradeshik Congress Executive Committe Udipi.
-1959	Malpe	Shri T.M.A. Pai	Registrar Academy of General Education, Manipal.
-1959	Do.	Shri T.R.U. Pai	Managing Director, the General Investment and Commerce Corporation Private Ltd., Udipi.
-1959	Do.	Shri Y.G. Hombalayya.	Chairman. Mangalore Port Trust.
5-1959	Do.	Shri V. Subraya Mallye.	Vice Chairman. Mangalore Port Trust.
-5-1959	Do.	Shri B.S. Baker Rai	Member. Mangalore Port Trus
-5-1959	Do.	Shri D. Machado	Do.
-5-1959	Do.	Shri M.D. Kamath	Do.
-5-1959	Do.	Shri A. Kugpunnitra.	Do.
-5-1959	Do.	Shri S.N. Nayak	Do.
-5-1959	Do.	Shri S.P. Nayak	Do.
-5-1959	Do.	Shri M. J. Kamath	Do.
-5-1959	Do.	Shri K.S. Ballal .	Secretary. Mangalore Port Trust.
-5-1959	Do.	Shri B.V. Baliga .	M.L.A., Mysore State.
-5-1959	Do.	Shri V.S. Kudva .	Industrialist and ex-Vice Chairman, Mangalore Port Trust.
-5-1959	Do.	Shri M.S. Nayak .	President, Kanara Chamber of Commerce, Mangalore.
-5-1959	Do.	Shri M. Raghavandra Rai.	Kanara Chamber of Commerce, Mangalore.
-5-1959	Do.	Dr. I.S. Patel	Do.
-5-1959	Do.	Shri A.R. Salotore	Do.
5-1959	Do.	Shri K.C. Nair .	Do.

1	2	3	4	5
62	3-5-1959	Malpe	Shri K.P. Hedge .	Kannara Chamber of Commerce Mangalore.
63	6-5-1959	Bangaloie	Shri D.K. Srinivasachar.	Secretary, P. W. D. Mysore State Government.
64	6-5-1959	Do.	Shri B.M. Abubaker I.A.S.	Secretary, Industry and Commerce Department, Mysore State Government.
65	6-5-1959	Do.	Shri T. Shamanna, I.A.S.	Director of Industry and Commerce, Mysore State Government.
66	6-5-1959	Do.	Shri G.S. Ganapathi	Chief Engineer (General), Mysore State Government.
67	6-5-1959	Do.	Shri T.P. Krishnachar.	Director, Geology and Mines, Mysore State Government
68	6-5-1959	Do.	Shri B.P. Radhakrishana.	Organiser of Mineral Development, Mysore State Government.
69	6-5-1959	Do.	Shri P.L. Rao	P. A. to Director of Fisheries.
70	6-5-1959	Do.	Shri Jeenabhai Devidass.	President, Mysore Chamber Commerce.
71	6-5-1959	Do.	Shri K. Sarangapani Mudaliar.	Member, Mysore Chamber Commerce.
72	6-5-1959	Do.	Shri A. Krishnamurthy,	Do.
73	6-5-1959	Do.	Shri S.G.A. Naidu	Do.
74	6-5-1959	Do.	Shri S.A. Srinivasan	Do.
75	6-5-1959	Do.	Dr. I.G. Patel	Do.
76	6-5-1959	Do.	Shri F. Ahmed	Do.
77	6-5-1959	Do.	Shri C.D Gopala Iyenga.	Do.
78	6-5-1959	Do.	Shri Dr.K. Srinivasachar.	Secretary, Public Works Department, Government of Mysore, Bangalore.
79	20-8-1959	Ratnagiri	Shri M.J. Sawant .	President, Municipal Borough Ratnagiri.
80	20-8-1959	Do.	Shri. M.D. Joshi	Member, Municipal Borough Ratnagiri.
81	20-8-1959	Do.	Shri L.V. Joshi	Do.
82	20-8-1959	Do.	Shri S.N. Surve	Do.
83	20-8-1959	Do.	Shri R.S. Sansare	Do.

2	3	4	5
-8-1959	Ratnagiri	Shri S.J. Bashte	Member, Municipal Borough, Ratnagiri.
-8-1959	Do.	Shri S.B. Gandhi	Do.
-8-1959	Do.	Shri H.J. Dhanji	Do.
-8-1959	Do.	Shri S.R. Shikhare	Do.
-8-1959	Bombay	Shri N.D. Sahukar	Representative of All India Manufacturers' Organization, Bombay.
-8-1959	Do.	Shri P.L. Padmi	Do.
-8-1959	Do.	Shri Murarji Jewadia	Do.
-8-1959	Do.	Shri Babubhai C. Shroff	Representative of All India Manufacturers' Chambers, Bombay.
-8-1959	Do.	Shri Meganbhai N. Sawani	Do.
-8-1959	Do.	Shri Chandubhai C. Jeverai.	Do.
-8-1959	Do.	Shri Harilal A. Bharucha.	Do.
-8-1959	Do.	Shri Damodar Mathuradas Ashar	Representative of the Sailing Craft Vessels Association.
8-1959	Do.	Dr. M. J. Pandiya	Director of Geology and Mining, Government of Bombay, Nagpur.
8-1959	Do.	Shri M. A. Tiwatikar	Representative of the Ranpur Port.
8-1959	Do.	Shri Mohan Tekankar	Do.
8-1959	Do.	Shri K. V. Dongre	Do.
8-1959	Do.	Shri K. C. Joshi	Do.
8-1959	Do.	Dr. B. R. Samant	Do.
8-1959	Do.	Dr. M. J. Birje	Do.
8-1959	Do.	Shri Y. R. Yadav	Do.
8-1959	Do.	Shri S. G. Barve	Secretary, Public Works Department, Bombay.
8-1959	Do.	Shri U. J. Bhat	Chief Engineer, P.W.D., Bombay
8-1959	Do.	Shri M. V. Rajwade	Deputy Secretary, Public Works Department, Bombay.
9-1959	Bhubaneswar	Shri S. M. Agarwal	Representative of the Orissa Chamber of Commerce.
9-1959	Do.	Shri D. K. Patnaik	Do.

1	2	3	4	5
109	14-9-1959	Bhubaneswar	Shri P. R. Parija.	Representative of the Orissa Chamber of Commerce.
110	14-9-1959	Do.	Shri S. C. Bose	Representative of the Utkal Mining and Industrial Association.
111	14-9-1959	Do.	Shri Bimal Kant Gosh	Do.
112	14-9-1959	Do.	Shri Arum Dey	Do.
113	14-9-1959	Do.	Shri Purusotham Sunderdas	Representatives of the Orissa Mill-owners Association.
114	14-9-1959	Do.	Shri B.L.N. Swamy	Do.
115	16-9-1959	Do.	Shri D. L. Purkayastha, I.A.S.	Additional Secretary to the Government of Orissa, Industries Department.
116	16-9-1959	Do.	Dr. B.D. Prusty.	Deputy Director of Mines.
117	16-9-1959	Do.	Shri K. S. Ramachandran, I.A.S.	General Manager, Orissa Mining Corporation.
118	16-9-1959	Do.	Shri G.C. Dass.	Director of Agriculture, Govt. of Orissa.
119	16-9-1959	Do.	Shri H.N. Mitra.	Director of Fishries.
120	16-9-1959	Do.	Shri M.C. Pani.	Deputy Chief Engineer, P.W.D. Orissa.
121	16-9-1959	Do.	Shri V. S. Mathews, I.A.S.	Secretary, Supply Department, Govt. of Orissa.
122	18-9-1959	Kakinada	Shri N.C. Krishniah	Chairman, Kakinada Chamber of Commerce.
123	18-9-1959	Do.	Shri R.E.A. Benson.	Member, Kakinada Chamber of Commerce.
124	18-9-1959	Do.	Shri J.A. Shafton.	Do.
125	18-9-1959	Do.	Shri M.G. Kurma.	Do.
126	18-9-1959	Do.	Shri E. Mohanaram.	Do.
127	18-9-1959	Do.	Shri S. Sibgathullh.	Do.
128	18-9-1959	Do.	Shri K. Lakshman Rao.	Do.
129	18-9-1959	Do.	Shri A. Lakshmi Narayana.	Do.
130	18-9-1959	Do.	Shri B.N. Rao.	Do.
131	18-9-1959	Do.	Shri Appana Subbiah.	Do.
132	18-9-1959	Do.	Shri V.V.N. Sreshti	Do.
133	18-9-1959	Do.	Shri M.M. Sastri.	Do.
134	19-9-1959	Masulipatam	Shri Jaldev Rama Rao.	Representing M/s Jaldev Rama Rao & Co.

1	2	3	4	5
135	19-9-1959	Masulipatam	Shri M. Jaganatha Rao.	Representing M/s Bharat Marines (Private) Ltd.
136	19-9-1959	Do.	Shri M.V. Sastry.	Do.
137	19-9-1959	Do.	Shri V. Varada Ropela.	Do.
138	19-9-1959	Do.	Shri D. Satyar.	Representing M/s. D.S. Narayana & Co.
139	19-9-1959	Do.	Shri Someswara Rao.	Representing M/s. P.V. Rangayy & Sons.
140	19-9-1959	Do.	Shri Laxmanta Rao.	Representing M/s P. Laxmanta Rao & Co.
141	19-9-1959	Do.	Shri Raghu Rama Rao.	Representing M/s. Eastern Shipping Corporation.
142	19-9-1959	Do.	Shri A.N. Rao.	President, Krishna District Chamber of Commerce.
143	19-9-1959	Do.	Shri D.V. Rao.	Secretary, Krishna District Chamber of Commerce.
144	19-9-1959	Masulipatam	Shri V. Ranga Rao	Member, Krishna District Chamber of Commerce.
145	19-9-1959	Do.	Shri Tadepalle Basavaiah	Secretary, Masulipatam Port Development Committee.
146	19-9-1959	Do.	Shri J.V.S.K. Bapana Rao.	Do.
147	19-9-1959	Do.	Shri N. Bhaktavatsalam.	Legal Adviser and Member of the National Harbour Board representing Andhra Rashtria Sailing Vessels Association.
148	21-9-1959	Hyderabad	Shri C.S. Tyabjee	President, Federation of Chamber of Commerce & Industry, Hyderabad.
149	21-9-1959	Do.	Shri P. L. Bhandari	Senior Vice President, Federation of Chamber of Commerce Industry.
150	21-9-1959	Do.	Shri M. G. Lakshmi Narasu.	Vice President, Federation of Chamber of Commerce & Industry, Hyderabad.
151	21-9-1959	Do.	Shri R. Prasad, I.C.S.	Secretary to Government Public Works Department.
152	21-9-1959	Do.	Shri B. L. Oates, I.A.S.	Additional Secretary to Government Industries Department.
153	21-9-1959	Do.	Shri T. Prabhakara Rao, I.A.S.,	Deputy Secretary to Government, Public Works Department.

1	2	3	4	5
4	21-9-1959	Hyderabad	Shri L. Venkatakrishan Ayyar.	Special Chief Engineer (Irrigation).
5	21-9-1959	Do.	Shri N. Durrani	Chief Engineer (Highways).
6	21-9-1959	Do.	Shri V. Pappu	Chief Engineer, Andhra Pradesh State Electricity Board.
7	21-9-1959	Do.	Shri Venkataraman	Assistant Operational Superintendent, Southern Railways.
8	23-10-59	Surat	Shri Babubhai R. Solanki.	Vice-President, Surat Chamber of Commerce.
9	23-10-59	Do.	Shri T. T. Popawala	Member, Surat Chamber of Commerce.
0	24-10-59	Do.	Shri Dayabhai H. Patel.	President, District Local Board Broach.
1	24-10-59	Do.	Shri Dwarkadas Mehta.	District Executive Engineer.
2	24-10-59	Do.	Shri Nagsinghbhai Nareilwala.	President, Cocoanut Merchants' Association.
3	24-10-59	Do.	Shri Asharam Chunilal Gandhi	President, Broach Merchants' Association.
4	24-10-59	Do.	Shri Rutuprasad Bhatt.	Secretary, District Development Board, Broach.
5	24-10-59	Do.	Shri Nambhai Shah	Secretary, Distric Congress Committee, Broach.
6	14-11-59	Calicut	Shri H. M. Rao	Representative of the opposition party in the Calicut Municipality.
7	14-11-59	Do.	Mrs. Kallat	Vice-Chairman, Calicut Municipality.
8	14-11-59	Do.	Mr. Madhava Menon	Leader of the Congress party in the Calicut Municipality.
9	14-11-59	Do.	Shri Kuntunni Nair	Municipal Commissioner, Calicut Municipality.
0	14-11-59	Do.	Capt. A.I. Mathunny	Chairman, Calicut Chamber of Commmerce.
1	14-11-59	Do.	Mr. G. Robson	Secretary, Calicut Chamber of Commerce.
172	14-11-59	Do.	Shri V. R. Lakhshmi Rattan.	Member of the Calicut Chamber of Commerce.
173	14-11-59	Do.	Mr. U. K. Sankunni	President, Malabar Chamber of Commerce.
174	14-11-59	Do.	Mr. C. C. Vulson.	Secretary, Malabar Chamber of Commerce.

1	2	3	4	5
175	16-11-59	Alleppey	Shri A. R. Sulaiman Sait.	Representative of Travancore Chamber of Commerce.
176	16-11-59	Do.	Shri R. Soman	Do.
177	16-11-59	Do.	Shri C. D. C. Dove	Do.
178	16-11-59	Do.	Shri K. Srinivasan	Do.
179	16-11-59	Do.	Shri R. Krishna Aiyar	Do.
180	16-11-59	Do.	Shri T. J. Thomas	Do.
181	16-11-1959	Do.	Shri N. Sankara Mannar.	Member, the Alleppey Chamber of Commerce.
182	16-11-59	Do.	Shri V.J. Joseph.	Representing Alleppey Oil Millers & Merchant Association.
183	16-11-60	Do.	Shri Karmsey Morarji.	Representing Travancore Millers' Association and Alleppey Produce Merchants' Association.
184	16-11-59	Do.	Shri S Narayanaswami.	Representing Travancore Coir Mats & Matting Manufacturers' Association.
185	16-11-59	Do.	Shri V.I. Perumal	Do.
186	16-11-59	Do.	Shri Perumal Jacob.	Representing Travancore Cochin Coir Mats and Matting Exporters' Association.
187	16-11-59	Do.	Shri Damodaran Pillai.	Representing Alleppey Port Contractors' Association.
188	16-11-59	Do.	Shri S. Veeriah Reddiar.	Representing Alleppey Piecegoods Merchants' Association.
189	16-11-59	Do.	Shri K.R. Sreedharan.	Representing Port Advisory Committee Kerala.
190	16-11-59	Do.	Shri Jacob Fernadaz.	Do.
191	16-11-59	Do.	Shri D.J. Gonzago. .	Do.
192	16-11-59	Do.	Shri M. Rajarajavarma.	Addl : Principal Port Officer, Alleppey.
193	17-11-59	Koilthottam .	Shri H.R. Henderson	Representing Travancore Minerals (Private) Ltd., Quilon.
194	17-11-59	Do.	Shri P.G. Varghese.	Representing Southern India Cashewnut Co.
195	17-11-59	Do.	Shri P.K. Narayanan.	Representing Quilon Merchants Association.
196	17-11-59	Do.	Shri A C. Webster .	Representing Hopkin & Williams, Travancore (Private Ltd., Koilthottam.

1	2	3	4	5
197	17-11-59	Neendakara .	Dr. Claus Sunnana .	Director General (Fisheries), Govt. of Norway.
198	17-11-59	Do.	Mr. Earnest Kroag Hansen.	Director, Indo-Norwegian Project, Neendakara.
199	17-11-59	Quilon .	Shri K. Kesvan Potty.	Representing Gandhi Sevasamajam.
200	17-11-59	Do.	Shri P. John Mathew	Do.
201	17-11-59	Do.	Shri K. Sankaranarayan Nayar.	Do.
202	17-11-59	Do.	Shri A. Abdulreheman.	Do.
203	17-11-59	Do. .	Shri D. J. Gongazo .	Do.
204	17-11-59	Do.	Shri J. S. D'cruz. .	Representing Casual Labours and Non-employees Association, Tangasseri, (Quilon).
205	17-11-59	Do.	Shri Kannam-Thanam.	Representative of Youngmen Society, Tangasseri.
206	17-11-59	Do.	Shri T. Krishnam. .	Ex-M.L.A. representing West Quilon Mandal Congress Comittee, Kavanad.
207	17-11-59	Do.	Shri Baby John. .	Representative of Chavra port Workers Union.
208	17-11-59	Do.	..	Three representatives of the South India Cashewnuts Manufacturers Association, Quilon.
209	17-11-59	Do.	..	Four representatives of the Kerala Cashewnuts Manufacturers Association.
210	17-11-59	Do.	..	Four representatives of the 'Quilon Merchants' Association, Quilon.
211	18-11-59	Trivandrum .	Shri V. Ramasubhan	District Operating Superintendent (Goods), Southern Railway, Madras.
212	18-11-59	Do.	Shri Bakthavatsalu.	Assistant Traffic Superintendent (Movements), Southern Railway, Madras.
213	18-11-59	Do.	Shri T.P. Kuttiamu.	Chief Engineer (General and Projects), Govt. of Kerala.
214	18-11-59	Do.	Shri C. S. Padmanabha Iyer.	Chief Engineer (Irrigation), Government of Kerala.
215	18-11-59	Do.	Shri Gopinath Pillai.	Director of Fisheries.

1	2	3	4	5
216	18-11-59	Trivandrum	Shri K. I. Gangadharan.	Deputy Secretary to the Govt. of Kerala, Public Works Department.
217	18-11-59	Do.	Shri P. Kannan Menon.	Assistant Secretary to Government of Kerala, Public Works Department.
218	18-11-59	Do.	Capt. P. P. Prasad.	Principal Port Officer, Calicut.
219	18-11-59	Do.	Shri R. Sankaranarayana Iyer.	President of the Chamber of Commerce, Trivandrum.
220	18-11-59	Do.	Shri C. P. Gopala Panikar.	Member of the Chamber of Commerce, Trivandrum.
221	18-11-59	Do.	Shri S. V. Pandit .	Vice-President, Chamber of Commerce, Trivandrum.
222	18-11-59	Do.	Shri K. Arunachalam.	General Secretary of the Chamber of Commerce, Trivandrum.
223	18-11-59	Do.	Shri A. Subramoiam.	Secretary, Chamber of Commerce, Trivandrum.
224	18-11-59	Do.	Shri Linus D'Crus .	Member, Chamber of Commerce, Trivandrum.
225	14-12-59	Sikka .	Shri S. K. Somani .	Representative of Shri Digvijay Cement Company, Sikka.
226	14-12-59	Do.	Shri V. N. Somani .	Do.
227	14-12-59	Do.	Shri R. P. Maloo .	Do.
228	14-12-59	Do.	Shri V. R. Dongrey.	Do.
229	14-12-59	Do.	Shri C. N. Bhadelawala.	Representative of the Navanagar Chamber of Commerce, Jamnagar.
230	14-12-59	Do.	Shri K. D. Raithatha	Do.
231	14-12-59	Do.	Shri Shivji R. Shah	Do.
232	14-12-59	Do.	Shri Balubhai M. Solanki.	Do.
233	14-12-59	Do.	Shri Ranjit Bhai P. Mehta.	Do.
234	16-12-59	Okha .	Shri Govindji Goverdhandas.	President, Okha Municipality.
235	16-12-59	Do.	Shri Ishwarlal Joshi	Member of the Chamber of Commerce, Okha.
236	16-12-59	Do.	Shri Tulsidas .	Representative of Shipping Agents and Member of the Chamber of Commerce.

1	2	3	4	5
237	16-12-59	Okha	Shri I. G. Thakker .	Steamship Agent representing M/s. P.L. Pandian & Co.
238	16-12-59	Do.	Shri Shatilal S. Shah.	Member of the Chamber of Commerce.
239	16-12-59	Do.	Shri Rodriques. .	Representing Steamship Agents.
240	16-12-59	Do.	Shri Rambhai .	Member of the Chamber of Commerce & representing M/s. Manavati, 16, Bank Street, Bombay—1.
241	16-12-59	Do.	Shri P. V. Desai .	Secretary, Okha Municipality.
242	16-12-59	Do.	Shri M. C. Desai .	Representative of the Scindia Steamship Co.
243	16-12-59	Do.	Shri T. S. Shiv Ram	Manager of Tatas, Mithapur.
244	17-12-59	Porbandar .	Shri Maldevji Odedra.	M.L.A.
245	17-12-59	Do.	Shri Kalidas Harji Thakker.	President of the Chamber of Commerce.
246	17-12-59	Do.	Shri Haridas Narainda:chatai.	Member of the Chamber of Commerce.
247	17-12-59	Do.	Shri Bagwandas Parshottam.	Industrialist.
248	17-12-59	Do.	Shri Radhesham Revagra.	Manager, Saurashtra Chemicals.
249	17-12-59	Do.	Seth Manjibhai K. Mehta.	Social worker and Industrialist.
250	17-12-59	Do.	Shri A. V. Shah .	Manager, Renavaj Cement Factory.
251	17-12-59	Do.	Dr. B. D. Yalan .	President, Probandar Municipality.
252	18-12-59	Veraval .	Shri Narandas Jethalal Sonich.	President of the Chamber of Commerce.
253	18-12-59	Do.	Shri Vamandas Tennes.	Member, Sorath Chamber of Commerce.
254	18-12-59	Do.	Shri Ramneklal J. Parekh.	Do.
255	18-12-59	Do.	Shri Chunni Lal Khapandi.	Representative of the Sailing Vessels Association.
256	18-12-59	Do.	Shri Meghji Manji .	Do.
257	19-12-59	Bhavnagar .	Shri P. R. Mehta .	President, Saurashtra Chamber of Commerce.
258	19-12-59	Do.	Shri N. A. Mehta .	Vice-President, Saurasht Chamber of Commerce.

1	2	3	4	5
259	19-12-59	Bhavnagar	Shri M. R. Sanghni.	Honorary Secretary, Saurashtra Chamber of Commerce.
260	19-12-59	Do.	Shri V. G. Vora .	Secretary, Port Development Committee.
261	20-12-59	Ahmedabad .	Sheth Shri Ratilal Nothalal.	Chairman, Gujerat Chember of Commerce.
262	20-12-59	Do.	Shri Chandulal Premchand.	Vice-Chairman, Gujerat Chamber of Commerce.
263	20-12-59	Do.	Shri Amritlal Hargovandas.	Member, Gujerat Chember of Commerce.
264	20-12-59	Do.	Shri Sarabhai Khashiparekh.	Member, Gujerat Chamber of Commerce.
265	20-12-59	Do.	Shri Premchand Gokaldas.	Do.
266	20-12-59	Do.	Shri Girdharlal Dayaram Mehta.	Do.
267	20-12-59	Do.	Shri Laxmidas V. Dani.	Secretary, Gujerat Chamber of Commerce.
268	21-12-59	Bombay .	Shri N. V. Sagan .	Representative of the Standard Vacuum Oil Company.
269	21-12-59	Do.	Shri M. K. Bilimoria.	Do.
270	21-12-59	Do.	Shri J. Holland .	Representative of the Burmah Shell Oil Company.
271	21-12-59	Do.	Shri P. Sirmountford.	Do.
272	21-12-59	Do.	Shri N. S. Parasuram	Representative of the Caltex Oil Company.
273	21-12-59	Do.	Shri Damodar Mathradas Ashar.	Representative of the All India Sailing Craft Industries Association, Bombay.
274	21-12-59	Do.	Shri O. E. Oommen	Senior Transportation Officer, Western Railways.
275	21-12-59	Do.	Shri K. V. Shah. .	Junior Commercial Officer, Western Railways.
276	21-12-59	Do.	Shri U. J. Bhat .	Chief Engineer (Roads and Buildings), Bombay.
277	21-12-59	Do.	Shri M. V. Rajwade	Deputy Secretary to the Govt. of Bombay, Public Works Department (Roads).

APPENDIX VI

List of Chief Ministers/Ministers with whom the Committee had the honour to meet and discuss

Sl. No.	Date	Place	Name of Minister/Chief Minister
1	2	3	4
1	5-3-59	Madras	Shri Kamraj Nadar, Chief Minister, Madras.
2	5-3-59	Madras	Shri P. Kakkan, Minister for Public Works Department, Madras.
3	6-5-59	Bangalore	Shri T. Subbaramanya, Minister for Law, Labour & Local Self-Government, Bangalore (Mysore State).
4	6-5-59	Bangalore	Shri B. D. Jatti, Chief Minister, Mysore State, Bangalore.
5	25-8-59	Bombay	Shri Y. B. Chavan, Chief Minister, Bombay State, Bombay.
6	16-9-59	Bhubaneswar	Shri H. K. Mehtab, Chief Minister, Orissa State, Bhubaneswar.
7	16-9-59	Do.	Shri R. N. Singh Deo, Minister for Finance, Orissa State, Bhubaneswar.
8	16-9-59	Do.	Shri N. Routaray, Ministder for Supply, Orissa State, Bhubaneswar.
9	21-9-59	Hyderabad	Shri Sanjeeva Reddi, Chief Minister, Andhra Pradesh, Hyderabad.
10	21-9-59	Do.	Shri J. V. Narasingha Rao, Minister, Public Works Department, Andhra Pradesh, Hyderabad.
11	18-11-59	Trivandrum	Shri P. V. S. Rao, Adviser to the Governor, Kerala State, Trivandrum.
12	21-12-59	Bombay	Shri Rasipalal Parikh, Minister for Industries, Bombay State, Bombay.

Appendix VII

EXISTING FACILITIES AT THE PORTS*

1. *The Port of Paradip.*

(a) *Shore facilities.*

1. 3 temporary wooden jetties.
2. 2 open storage areas.
3. Vast area of land Estate.

(b) *Harbour craft.*

1. 2 tugs.
2. 1 Pilot vessel.
3. 1 Service launch.
4. 1 Survey launch.
5. 1 lighter.

(c) *Navigational aids.*

None at present.

(d) *Cranes.*

None at present.

(e) *Workshop and workshop equipment.*

None at present.

2. *The Port of Kakinada.*

(a) *Shore facilities.*

1. Old passenger jetty on screw piles with timber decking 150 feet in length, now used as a customs examination jetty, depth alongside 6 feet.

2. 383 feet of wharf wall for the workshop constructed with reinforced concrete sheeters. Depths alongside 6 feet.

3. A dry dock for port craft, length 165 feet, breadth 35 feet.

R. L. of sill at entrance	..	−4.0
R. L. Top of wall	..	+10.0
R. L. of sill of dry dock	..	−7.0

The dry dock is equipped with two dewatering pumps actuated by 2 electric motors of 20 and 10 H.P., the two pumps working together being able to dewater the dry dock in 6 hours.

4. Canal Boat wharf 665 feet long, depth alongside 3 feet.

*Details as supplied by the respective State Governments.

5. A port and Customs Office.
6. Approximately 4 old timber jetties owned by private parties now wharfwall.
7. Stacking area for ore served by square feet.
8. Several transit sheds and storage parties.
9. Seven reinforced concrete wharf Kakinada side and the seventh is Commercial Canal. Depth along
10. One Slipway natural slope earth for on south side of commercial canal.
11. Two groynes 16,000 feet in length the inner harbour.

(b) *Harbour craft.*

1. A bucket dredger 'Coromandel', Coal 120 feet' breadth 27 feet, and dra engine of 150 H.P. built 1900.
2. Grab dredger 'Cocanada', coal fired breadth 21'—6" and 2'—6" draug of 60 H. P. built 1912.
3. Twin screw tug "Godavari II", 140 length, 15 feet in breadth, 4'—6" built 1928.
4. Twin screw diesel launch "Marpol", 50' × 10' × 3'—6" draught, built 1932.
5. Steam launch "Coringa" coal fired 53' × 10' 5' draught, built 1932.
6. Single screw 10 H. P. Diesel Boat "Ja
7. Three teakwood Anchor Boats.
8. Three dumb steel Hopper Barges A, poor condition. "B" Barge has bee of in Public Auction. Only 2 in
9. Four Mud Punts 60' × 4'.
10. Wooden lighters Nos. 84 privately tons.

(c) *Navigational aids.*

1. The Vakalapudi lighthouse about 4 entrance to Kakinada Canal, the li elevation of 80 feet from a white ma
2. One flashing light at Godavari Poi eastward of Vakalapudi Lighthouse.
3. One flashing light is exhibited at the g
4. The Port boundary pillars.
5. The outer dredged channel from the 3,500, feet, 250 feet in width, marke

nd Customs Office.
mately 4 old timber jetties a by private parties now be all.
area for ore served by r feet.
ransit sheds and storage go
inforced concrete wharf wa da side and the seventh is on rcial Canal. Depth alongs way natural slope earth for th side of commercial canal.
ynes 16,000 feet in length ea er harbour.

raft.
dredger 'Coromandel', Coal t' breadth 27 feet, and drau of 150 H.P. built 1900.
dger 'Cocanada', coal fired 21'—6" and 2'—6" draught H. P. built 1912.
ew tug "Godavari II", 140 H 15 feet in breadth, 4'—6" dr 928.
ew diesel launch "Marpol", × 3'—6" draught, built 1932.
unch "Coringa" coal fired 0' 5' draught, built 1932.
ew 10 H. P. Diesel Boat "Jan
kwood Anchor Boats.
mb steel Hopper Barges A, ndition. "B" Barge has been ublic Auction. Only 2 in
d Punts 60' × 4'.
lighters Nos. 84 privately o

l aids.
alapudi lighthouse about 4 to Kakinada Canal, the lig n of 80 feet from a white mas ing light at Godavari Poi d of Vakalapudi Lighthouse. ing light is exhibited at the gr boundary pillars.
r dredged channel from the et, 250 feet in width, marked

6. Morse signalling from the Lighthouse.
7. Flag Mast near Lighthouse and near the Port Office for displaying storm signals.
8. Flag signalling at Lighthouse.
9. Radio telephones at the Port Office.
10. One wreck marking buoys to mark the position of a wrecked iron ore lighter in steamer anchorage.

Lighthouse in the Bay to be installed in the near future.

(d) *Cranes.*

1. One 8 ton steam crane at the crane siding for heavy lift.
2. A 5 ton hand crane at the crane siding.
3. A 3 ton hand crane at the crane siding
4. A 1 ton hand crane at the dry dock.
5. 2 half ton hand cranes at the passenger jetty.

(e) *Workshop and workshop equipment.*—A well equipped workshop is available in the Port for repairs to the floating craft. The machinery installed at present consists of 3 Lathes, 8″, 10″ and 12″: one Punching and Sheering machine, one Grinding machine and one screw cutting machine and a circular saw bench. There is a Blacksmith's Shop attached to the Workshop. The workshop is also equipped with one set of Arc welding and one set of Gas welding plants. One availing installation, one new 10″ Lathe, one Radial drill with tilting table, one new Punching and Sheering machines and one Milling machine are also available.

3. *The Port of Masulipatnam.*

(a) *Shore facilities.*

1. 2250 feet of whatfwall of dry stone masonry on concrete foundations, depth, alongside being 6″ at low water.
2. 3 small wharves each 50 feet in length located in Masulipatnam fresh water canal.
3. Wide quay space for iron ore served by railway sidings.
4. A port and customs office.
5. 6 godowns paralled to the wharf, 150′ from the edge of the quay, one belonging to private parties. Some of these godowns are rented to Government for the storage of grain, the remainder being practically empty. Now in a poor condition.
6. Vast area of open storage space is available on both sides of the channel.

(b) *Harbour craft.*

1. Motor Launch "M.L. Bandar" of 4 tons gross-Nett 2 tons, Length 29 feet, breadth 6 feet, draught 1′ — 6″, speed 6 knots and powered by an engine of 14 H. P. built 1936.
2. Grab dredger "Masulipatnam"—31′—0″ × 9′—6″ × 5′—3 "Gross 11 tons — Nett 11 tons built 1956 30 H. P. non propelled.

3. Suction Dredger "Akhanda Godavari"—90′—0″ × 20′ —0″ × 6′—0″
   Nett 108 tons — gross 108 tons.
   160 H. P. — Non-propelled.
4. Two mud Punts—open 60′—0″ × 15′—0″ × 4′—0″
5. 50 lighters owned by private sector of average 30 tons capacity, the total tonnage being 1500 tons.

(c) *Navigational aids.*

1. The position of the Bar is indicated by exhibiting two bar lights, one red and the other white for the safe entering of boats into the channel.
2. A lighthouse at Lat. 160° — 35′ N, 82° — 17′E, and a prominent chimney about 94′ high stands about 3½ miles North, North-westwards of the creek charted for the guidance of steamers.
3. The old disused lighthouse tower at the point Devi near estuary of River Krishna of no further use for navigational purposes.
4. An anchorage buoy at this Port is moored about 4 miles eastward of the Lighthouse to mark the position for boats to wait outside the Port in order to communicate with vessels approaching the port.
5. A Morse Signalling station over the terrace of the Port Office and the signals are transmitted during nights only.
6. The general system of storm warning signals is in force.
7. 3 boundary pillars and survey pillars.
8. The port flagstaff is situated on the wharf for the hoisting of storm warning signals etc., for the guidance of lighters.

(d) *Cranes.*

One hand crane of 3 ton capacity is installed on the wharf. This was used in pre-war years for hoisting timber.

(e) *Workshop and workshop equipment.*—Only private workshops in town are available.

The Port of Cuddalore.

(a) *Shore facilities.*

1. Three landing wharves with a total length of 2987′ for working cargo, served by metre gauge railway siding and road.
2. One R.C.C. wharf 150 feet in length and nine R.C.C. jetties at the coal creek for handling coal.
3. There are adequate number of private storage godowns.
4. A dry dock 95′ × 32′ × 11′ for effecting repairs to port craft.
5. A slipway for hauling up pontoons of the Dredger (size of vessel 20′ and draft 4′ with present arrangements) slipway size 20′ × 150′ with hard minth 5 ton capacity.
6. A port and customs' office.

7. Stacking area of 31,500 sq. ft. for coal and 36,500 sq. ft. for iron ore and general cargo.

(b) *Harbour craft.*

1. Steel non-propelling pontoon type 160 H.P. suction dredger "Erskine" length 90 ft. width 20 ft. and depth 6 ft. tonnage 100 with a draft of 3' 3" fore and aft. 12" dia. pipeline with rubber joints 400 ft. in length and 18 steel pontoons are also available for reclamation work. The dredger is capable of dredging up to a depth of 12 ft. at the rate of 150 c. yds. free silt or sand per hour.
2. 2 Nos. wooden anchor boats. One boat is fitted with fixed derrick for lifting anchors.
3. One oil and water barge of steel construction for feeding dredger with water and furnace oil.
4. Port boat with out-board motor for the use of the Port Officer for inspection.
5. 216 cargo boats varying from 16 to 100 tons capacity with a total carrying capacity of 8070 tons.

(c) *Navigational aids.*

1. Light is exhibited at an elevation of 66 ft. from a white tower.
2. A white flagstaff, 102 ft. in height close northward of light house.
3. A signal station equipped with Day light Alids lamps in addition to Flag Signals and connected with Post and Telegraphs telephone system.

(d) *Cranes.*

1. 3 hand cranes of 1 ton capacity each at the port wharf.

(e) *Workshop and workshop equipment.*—A workshop now under construction with the necessary equipment consisting of:—

2 Lathes

1 Punching & Shearing Machine

1 Shaping Machine

1 Plate Bending Machine

Tool Grinder, Tilting Furnace

Drilling Machine and Welding Set.

The Port of Nagapattinam

(a) *Shore facilities*

1. Three wharves, namely, north wharf, central wharf and soutl wharf measuring in all a length of 1500 ft. and two ramp measuring 114'—0" × 50'—0" and 114'—0" × 61'—0"

Three cargo sheds of the following dimensions:—

'A' Shed : 88' × 44'—6" × 15'—6" (Ht) . . . 3916 sq. ft
'B' Shed : 88' × 44'—0" × 15'—6" (Ht) . . . 3872 sq. ft.
'C' Shed : 93' × 50'—0" × 16'—0" (Ht) . . . 4650 sq. ft.
'D' Shed : 100' × 30'—0" × 15'—0" (Ht) . . . 3000 sq. ft.

Two more sheds belonging to Central Government under Customs Department.

3. Two passenger waiting sheds (one for males and another for females, protected water supply, electric fittings etc. complete) visitor's waiting shed measuring 60'-0" x 20'-0" was constructed recently under development schemes. A saloon passenger shed has recently been completed.

4. A port and customs office.

5. Stacking areas for cargo.

6. 50,000 sq. ft. of metalled surface adjoining wharves and also an area of 2,50,000 sq. ft. (on the northern side of compound) as timber wharves are available as open storage area. The timber wharf area has no hard standing and no protection on the sea side.

7. The limits of the port are defined by boundary pillars, situated about one mile southward and half a mile northward, respectively of the mouth of Kaduvayar river.

8. Kaduvayar river between south wharf and road bridge is used for moorings etc. by country craft.

(b) *Harbour craft*

1. One steam, non propelling, grab dredger "Nega" fitted with a $\frac{3}{4}$ cu. yard bucket capable of dredging in mud and hard sand; length of vessel 50 ft. breadth 20 ft. depth 5 ft. and draught $2\frac{1}{2}$ ft., average output of dredging in silt per day is roughly 250 tons.

2. Two steel barges and one water and fuel pontoon.

3. One port boat.

4. One sea going dumb port boat, used by the Port Officer to visit the steamers.

5. 50 privately owned cargo lighters with a total registered tonnage of 2000 tons and capable of handling 700 tons of cargo.

(c) *Navigational aids*

1. A light is exhibited at an elevator of 80 feet from a white masonry tower, 83 feet in height, situated about one cable westward of the entrance to the Kaduvayar river. Situation Latitude 10 16' North Long. 79 51E. Flashing Aga light Flash 0·3 sec. eclipse 1·4 sec. flash 0·3 sec. eclipse 1·0 sec. Miles visible in clear weather 14 miles. Arc of illumination; visible alround.

2. A spherical buoy, painted green and surmounted by a staff and sphere, is moored about $1\frac{1}{4}$ miles east southeast ward of the lighthouse as a guide to the anchorage for vessels of moderate draught.

3. Two masonry boundary pillars.

North Pillar: Latitude 10°16'-15" North
Longitude 79°51'-10" East.

South Pillar: Latitude 10°44'-50" North.
Longitude 79°51'-00" East.

4. A signal station (Latitude 8°16′ Longitude 79°51′ E.) with which vessels at the anchorage off Nagapattinam can communicate using the international code of signals by day and at night by the Morse Code is situated on the roof of the Port Office building close southward of the Lighthouse.

(d) *Cranes*

1. A fixed crane of 2 tons capacity.
2. 2 Mobile cranes of 5 tons capacity.

(e) *Workshop and workshop equipment*

None at present but ordinary types of casting, drilling etc., can be taken up by the local foundry.

5. *The Port of Tuticorin*

(a) *Shore facilities*

1. One pier on screw piles for landing general cargo 315 ft. long and 37 ft. wide with two lines of metre gauge trolley tracks.
2. One pier for landing general cargo founded on reinforced concrete piles 478 ft. long by 10 ft. wide with reinforced concrete bracings, timber beams and timber decking and provided with 3 lines of metre gauge trolley tracks.
3. One small pier on screw piles having a length of 138 ft. and a breadth of 20 ft. for landing coal. The pier is not provided with trolley lines.
4. Steel sheet piled wharf wall 1,126 ft. in length along the fore shore, depths alongside being roughly 10 ft.
5. 44 Nos. of trolleys of 2½ tons capacity each for conveying goods to and fro between pier and sheds.
6. 8 Nos. of transit sheds capable of storing 1,17,500 bags of 2 cwt. each.
7. 54,000 sq. ft. of stacking area for coal and 70,000 sq. ft. for general cargo.
8. One fire engine.
9. About 100 acres of vacant land are vested in the Port Trust Board.
10. Open storage area of 4·52 acres within wharf area.

(b) *Harbour craft*

1. Bucket ladder dredger "Tuticorin" with hopper, twin screw, steel hull 175·5′ x 35·5′ x 13′, hopper capacity 500 tons, speed 9 knots, I.H.P. 800′, dredging depth 18 ft. loaded draught 8·5 ft. forward and 9·25 ft. aft. filling time of hopper one hour.
2. Motor launch "Comorin" wooden construction 12′ x 10′ x 5½″ powered by 2 engines each of 33 H.P. each.
3. Motor tug "Mannar", teak, twin screw, 64′ x 18′ x 6′ (draught), speed 10 knots free running two loaded lighters of 150 ton capacity each, powered by 2 diesel engines of 132 H.P. each.

4. One service launch for the use of dredger "Tuticorin".
5. 97 lighters of 100 ton average capacity belonging to private parties and having a total tonnage of 11,500.

(c) *Navigational aids*

1. A light exhibited from an elevation of 85 ft. from a masonry tower 91 ft. in height and painted in black and white bands located on the northern end of Hare Island.
2. A light at an elevation of 36 ft. from a white masonry obelisk situated on the southern part of Hare Island.
3. A light buoy marking Orripar reef painted red and white and exhibiting a red flashing light every 3 seconds roughly 2 cables northward of the reef.
4. 3 pairs of buoys marking the boat channel.
5. Lights exhibited at the heads of the Tuticorin piers.
6. Buoys at Sevendapuly and Kariapar marking reefs.
7. An obelisk 33 feet in height about 1½ cables north-westward of southwestern extremity of Van Hivu.
8. A light buoy marking the wreck of "Galatia", 1½ miles eastward of the lighthouse.
9. A lighthouse and signal station in the Hare Island.

(d) *Cranes*

1. One 5 ton crane, two 1 ton cranes and two 1½ ton cranes located on the concrete pier.
2. Four 1 ton cranes on the steel pier for general cargo.
3. One 1½ ton, one 2½ ton and one 3½ ton cranes located alongside the trolley lines—leading from the concrete pier.

(e) *Workshop and workshop equipment*

Private workshops are available in the town. Major repairs to the dredger are carried out at Mandapam approximately 100 miles away where there is a dry dock 250′ x 10′ and a modern workshop, owned and operated by the Railways.

7. *The Port of Neendakara*

There are no existing facilities at this port at present.

8. *The Ports of Beypore and Kozhikode*

Shore facilities

1. Beypore

1. Wharf wall on the right bank of the river for a length of 221 ft. and having a minimum depth of 2 to 3 ft. alongside.
2. A port and customs office.
3. Several private jetties for loading tiles into harbour craft

2. KOZHIKODE

South Pier

1. The pier, founded on screw piles and subsequently encased in reinforced concrete, 596 ft. in length and width varying from 52 ft. for 226 ft. from the seaward end and 28 ft. for the remaining length of 370 ft. pier equipped with 3 trolley lines with necessary cross overs. The pier area is enclosed by a boundary wall.
2. 19 platform trucks or trolleys of 3 tons capacity each, for transporting cargo between shore and pier.
3. Two open cargo sheds, seaward side walls 162′ x 35′ and 140′ x 35′.
4. Three cargo sheds 72′ x 35′, 63′ x 44′ and 50′ x 35′.
5. A canteen 32′ x 35′ for the labour by the conversion of a portion of one cargo shed.
6. Stacking areas with concrete paving having a total area of 39,000 sq. ft.
7. Several store rooms, talley clerks' rooms etc.

North pier

8. The pier founded on screw piles and recently encased in reinforced concrete 20 inches square, 532 ft. in length with a width of 52 ft. for 224 ft. from the seaward and 28 ft. for the remaining 308 ft. The pier is equipped with 3 sets of trolley lines on the seaward side and 2 sets on the landward stretch.
9. 19 platform trucks or trolleys of 3 ton capacity for carrying cargo from shore head to pier head.
10. Two open cargo sheds, one located near the pier and the other behind the port and customs offices, size 60′ x 35′ and 80′ x 35′ respectively.
11. Concrete paved stacking areas 5,900 sq. ft.
12. Store rooms.
13. Port and customs offices.
14. A signalling cabin and quarters for light keepers.
15. One slipway under construction.

(b) *Harbour craft*

1. One twin screw diesel tug "Zamorin", 132 H.P. 50′ x 11½′ with a draught of 5 ft., capable of towing 200 tons at 7 knots, gross registered tonnage 27·5 unladen speed 11 knots.
2. 274 Nos. of lighters and Masula type boats having a lighterage capacity of over 4,500 tons owned by private parties

(c) *Navigation aids*

1. A light house exhibiting a light at an elevation of 52 ft. from a white masonry tower 50 ft. in height located near the port office.

2. A light exhibited at an elevation of 23 ft. from a post at the head of the North Pier.

3. A light exhibited at an elevation of 23 ft. from a post at the head of the South Pier.

4. A pillar buoy painted in black and white vertical stripes is moored about 1½ miles west-south-west of the North Pier.

5. A red buoy marking the Coote reef is laid on the souther-west of the South Pier.

6. Kozhikode and Beypore ports have separte signalling stations.

7. Flag-staff for communication with shipping. Morse signalling is used during the hours of darkness.

(d) *Cranes* (at Kozhikode port only)

1. Two 3-ton steam cranes.
2. Two 5-ton hand cranes.
3. Nine 1-ton hand cranes.

(e) *Workshop and workshop equipment*

A small shed with a few hand tools located near the North Pier for carrying out minor repairs to the piers, cranes and trolleys. An electric drill has been purchase recently.

9. *The Port of Mangalore*

(a) *Shore facilities*

1. A stone masonry wharfwall, 1050 feet.
2. 3 Transit shed 8000 sq. ft. floor area.
3. A dry dock for use of crafts, launches, tug and dredgers 110′ x 30 feet.
4. A workshop building with welding apparatus.
5. A passenger shed with seating arrangement and an attached waiting room.
6. Port and shipping office.
7. One port store room, quarters for Port Officer with outhouses, servants quarters and motor shed attached.
8. Concrete stacking area for salt.
9. A floating pontoon jetty for embarkation and disembarkation of passengers.
10. One wooden jetty at Sandspit for use of ferry passengers.
11. Two large sheds owned by Customs for storing dutiable cargo.
12. Stacking area, 4 x ½ miles.
13. A weigh bridge owned by private party for weighing lorries up to 21 tons.
14. 3 fixed hand cranes 5 tons, 2 tons and 1 ton.

NOTE.—The Port area is electrified and connected to high pressure protected water supply.

(b) *Harbour Craft*

1. Suction Dredger 'Gurpur' with cutter equipment, hull size 90′ x 90′ x 6′, digging depth 12 ft. steam driven and coal fired; 600 ft. of floating pipeline. The dredger is non-propelling and is dentical in every respect to the dredger at Cuddalore.
2. A ¾ cubic yard Grab Dredger purchased in 1929, 50′ x 20′ x 5′ digging depth 20 ft. steam powered and non-propelling.
3. One 140 H.P. twin screw steam tug "Charles Henderson" 75′ x 16′ x 6′.
4. Motor launch "Mangalore", 42′ x 10′ x 2′ 8 inches for towage and inspection.
5. A motor boat 19′ x 4′ 6″ x 1′ 6″.
6. 3 dug out timber canoes roughly 20′ x 2′ x 2′ x 1′.
7. 2 wooden mud punts 38′ x 13′ x 4 ft. 6 inches.
8. 148 registered lighters of 10 to 60 ton capacity belonging to private parties.
9. Two private ferry motor launches.
10. One motor launch owned by Scindia Navigation Co.
11. Five pilot canoes.
12. 3 fixed hand cranes, 5 ton, 2 ton and 1 ton capacity respectively.
13. A weigh bridge for weighing lorries up to 21 tons.

(c) *Navigational aids*

1. Lighthouse.—A white flashing light is exhibited at an elevation of 53 ft. from a white masonry tower.
2. Two electric leading lights, one red and other green are exhibited at an elevation of 30 ft. and 42 ft. respectively in line with the bar to assist navigation on the bar at night.
3. Morse and International flag signalling have been provided at the port to exchange message from ship to shore. The flagstaff is 91 ft. high.
4. A flagstaff to display the storm warning signals.
5. Floating buoys are used for making the fairway channel in the inroads.
6. Port Pilot Service with five pilot canoes belonging to Port Pilots.

(d) *Cranes*

There are 3 fixed hand cranes at this port having capacities of 5 tons, 2 tons and 1 ton. The 5 ton crane is utilised for lighting steel pontoons of the floating pipeline for repairs.

(e) *Workshop and workshop equipment*

A small workshop building housing one mechanic and Carpenter attending to minor repairs and a welding room with welding apparatus. Many other private workshops (Mechanical) are available within the town area.

10. *The Port of Karwar*

(a) *Shore facilities*

1. A 800 ft. wharf wall constructed in stone masonry on the eastern side of Baitkal Cove, the depths alongside varying from 3 ft. on the southern end of the wharf to 4'-6" at the northern end.
2. A.R.C. jetty 90' x 40' for landing passengers.
3. Stacking area about 800' x 100'.
4. A passenger shed with canteen.
5. A transit shed.
6. A port office building 30' x 18'.
7. Departmental Rest House.

(b) *Harbour craft*

1. Privately owned tugs and barges are available for transport of cargo and passengers at the Port.

(c) *Navigational aids*

1. A lighthouse located on the sukmit of Devgad Island.
2. A red light at an elevation of 65' from a white mast located at Koney near the South-eastern end of Karwar Bay.
3. Two unlighted buoys, one marking the rocky shoal on the northern side of Karwar head and the other marking the 'Parker' rock about 4 miles west Kurmagad.
4. A flag staff to display storm warning signals, and day light signal lamp for communication between ship and shore at Koney.

(d) *Cranes.*—Two fixed hand cranes of 2 ton capacity each which are located on the northern end of wharf wall.

(e) *Workshop and workshop equipment.*—There is no workshop equipment available at Karwar Port.

11. *The port of Redi*

(a) *Shore facilities*

1. One jetty in mass concrete and founded on submerged rocks, constructed in the Bay within the shelter of Redi Point, 185' x 20' with 90' x 25' loading platform on the shore side for working lighters and 'Z' craft.

2. Stacking area for iron ore with 840' of trolley track. The mines now being worked are located within 200 ft. of the jetty.

(b) *Harbour craft.*—The Mining Company operates the following craft for the export of iron ore. These have been hired from Messrs Shaparia Dock Company, Bombay on a monthly basis:

1. 'Z' craft "Maheudra" 144' x 29' x 6' loaded draught, self-propelled, capacity 300 tons.
2. 'Z' craft "Anabuj' self-propelled 134' x 30' x 5'-6" loaded draught, capacity 200 tons.

3. Dumb barge 'Amrit', steel hull, capacity 150 tons.
4. Motor vessel 'Manek' for towing barges, powered by two engines of 120 H.P. each.
5. Motor launch "Chandra" powered by two engines of 165 H.P. each.

(c) *Navigational aids.*—The Mining Company have laid 6 buoys lighted at night with hurricane lanterns to mark the channel to the anchorage from the jetty.

(d) *Cranes.*—The port is not equipped with any crane.

(e) *Workshop and workshop equipment.*—The Mining Company runs a small workshop in the vicinity of the port.

12. *The Port of Ratnagiri*

(a) *Shore facilities*

1. A passenger jetty in Ratnagiri Bay, 1000′ x 12′ partly founded on piles and partly founded on caissions. The extreme end practically dries at low water, confining the use of the jetty to periods other than low tide.
2. Cargo handling beach on the right bank of the Ratnagiri creek near its mouth.
3. Waiting room for first class, second class and third class passengers.
4. A customs office which is also used as port office.

(b) *Harbour craft.*—The port does not possess any craft of its own. The central customs and Excise Department operates one launch. 4 'Khapatas' or country craft are operated by the B.S.N. Company for the transhipment of passengers.

(c) *Navigational aids*

1. A light at an elevation of 325 ft. is exhibited from a white tower located on southern bastion of the Fort.
2. Storm signals are displayed from the light house on the southern end of the Fort.
3. A light is periodically exhibited at an elevation of 15 ft. from a white iron column 24 ft. in height situated about half a mile eastward of the light on the southern end of the Fort.
4. A flashing beacon inside Ratnagiri Bay to mark the existing shoal.

(d) *Cranes*

The Port does not possess any crane.

(e) *Workshop and workshop equipment*

Petty workshop facilities are available at Ratnagiri.

13. *The Port of Surat*

(a) *Shore facilities*

1. A reinforced concrete jetty 130′ x 44′ and a wooden jetty of 63′ x 20′. One R.C.C.T.-shape of jetty of size 220′ x 20′ approach of 80′ x 20′ is under construction.

2. Wharf 230′ x 50′.

3. Central custom and Excise office also used as port office.

(b) *Harbour craft*

The port does not possess any craft of its own.

(c) *Navigational aids*

A light called Tapti light is exhibited at an elevation of 91 ft. from a white circular tower situated on Sumali point.

(d) *Cranes*

The port is not equipped with any crane.

(e) *Workshop and workshop equipment*

Workshop facilities are available at Surat city.

14. *The Port of Broach*

(a) *Shore facilities*

1. A small wooden jetty used for light cargo.

2. Central Excise and Customs House also used as the port office.

3. One transit shed of 30′ x 30′ for cargo is under construction.

4. R.C.C. Jetty under construction will handle all sorts of cargo and will afford berthing for a length of 360′.

(b) *Harbour craft*

The port does not possess any craft of its own. Nine sailing vessels having a total tonnage of (129) are registered at this port.

(c) *Navigational aids*

1. A red conical buoy marking the sands at the mouth of the river.

2. A light is periodically exhibited at an elevation of 30 ft. from an iron structure situated at Luhara Point.

(d) *Cranes*

The port is not equipped with any crane.

(e) *Workshop and workshop equipment*

Small workshop facilities are available in the town.

15. *The Port of Bhavnagar*

(a) *Shore facilities*

1. 106 buildings *e.g.* office buildings, rest rooms, fire-brigade station, quarters for staff, restaurants etc.

2. A dry dock with an opening of 40′.

3. A barge basin 210′ x 214′ x 20′ with an entrance of 34′.

4. Boat building plots.

5. Trade occupies an area of 25,70,882 sq. ft.

6. An entrance dredged to 6 ft. below L.W.O.S.T. and having a length of roughly 5,000 ft. and a bottom width of 100 ft. minimum, which is approached by ships at high water slack.

7. A turning circle 500 ft. minimum diameter and dredged to 6 ft. L.W.O.S.T.

8. The berthing basin having a length of roughly 1,000 ft. and width 100 ft. minimum and dredged to roughly 15 ft. below L.W.O.S.T.

9. A reinforced concrete jetty having a length of 882 ft. and width of 42 ft. safe load on jetty 5 cwt. per sq. ft. and 12 ton railway axle load. The jetty is connected to the shore by 2 approaches 200 ft. long and 28 ft. wide with railway track.

10. Two loading tracks, flush with the quay 880 ft. each, with draw off at each end.

11. Two transit sheds with floor at quay level and having no loading platforms. The sheds are constructed in steel framing with corrugated sheet side walling and Asbestos Cement sheet roofing. The floors are stone paved. Dimensions of sheds. (a) 110 ft. x 110 ft. and (b) 260 ft. x 120 ft.

12. A steel piled jetty built parallel to the bank of the creek for lighters or small craft up to say 600 tons connected to the shore by trucking and railway approaches. The dredged depth alongside is approximately 12 ft. above L.W.O.S.T. The safe load on jetty is 5 cwt. per sq. ft. and 12 tons railway axle load.

13. Transit and storage sheds having a total area of 93,600 sq. ft.

14. Additional 48 sheds in the port area and 3 godowns in the city with a total storage accommodation of 5,09,570 sq. ft.

(b) *Harbour craft*

1. Twin Screw Suction Cutter Dredger with hopper "Mativijaya" having a hopper capacity of 600 cubic yards reported to be in fair condition, rated output 1,000 tons per hour, dredging depth 15 ft., speed 9½ knots.

2. Non-propelling hydraulic pipeline suction dredger "reclaimer" stated to be in very poor condition, capacity 1,500 tons per hour.

3. A non-propelling hydraulic suction cutter dredger "Sudhara". Rated output 259 tons per hour. Dredging depth 30 ft.

4. Twin screw grab dredger with hopper of 500 tons capacity "Bhavsinhji" Rated output 200 tons per hour.

5. A small, old, non-propelling suction dredger capable of discharging 2,100 gallons per minute of sand and water against a head of 100 feet.

6. One pontoon type grab dredger recently purchased from Messrs I.H.C. Holland fitted with two grabs, each grab being of 2½ cubic yards capacity.

7. A 650 H.P. steam tug "Bhimsen" 86′ x 22′ x 10′—6″ (loaded draught), speed 10¼ knots.

8. A 400 H.P. steam tug "Balvan", 86′ x 19·9′ x 10′ — 3″ speed 9½ knots.

9. A 450 H. P. motor vessel "Tarae-192", 64′ x 15′ x 7′ capable of a speed of 11·5 knots.

10. A 450 H.P. motor vessel "Tanac-211" 64′ x 15′ x 7′ and having a speed of 11.5 knots.
11. Two tugs, (details not known).
12. Six launches, nine dumb boats and thirteen steel barges.

(c) *Navigational aids*

1. Wireless telegraph station.
2. A light at an elevation of 25 ft. located on Gogha bunder.
3. Leading lights for approaching Concrete Jetty.
4. A light at an elevation of 52 ft. on the south-western side of Bhavnagar channel known as Ruvapari light.
5. A light at Johnston point.
6. Floating light 1½ miles south-eastward of Rupavari light house.
7. A light at an elevation of 30 ft. north-westward of Bhavnagar point.
8. A light at an elevation of 30 ft. west-south-west-west-ward of Bhavnagar point.
9. A light at an elevation of 43 ft. exhibited from a tower on Bhavnagar bunder.
10. Five beacons on the northern side of Bhavnagar creek as leading marks.
11. Compulsory pilotage for steamers proceeding to Concrete Jetty and pilot vessel.
12. Moorings for lighters and ships.

(d) *Cranes*

1. Five 3-ton portal steam cranes at concrete jetty.
2. Three 3-ton cranes at the steel jetty.
3. Two 5 ton electric cranes at the dry dock ferry and Ramasar Creek.

(e) *Workshop and workshop equipment*

There is a fully equipped workshop near the old port which can undertake yearly and special repairs to the port fleet and shore gear.

16. *The Port of Veraval*

(a) *Shore facilities*

1. A breakwater roughly 1,650 ft. in length constructed in limestone masonry projecting into the sea which gives shelter to the inner harbour.
2. Two boat basins having wharfage accommodation for 14 country craft or lighters. At each wharf ramped approaches are also provided.
3. One dry dock of 150′ x 15′ with a clear entrance of 30′.
4. 5 open sheds and 30 godowns with an area of 17,000 sq. ft. and 80,000 sq. ft. respectively.
5. An automatic tide recording station.

6. An outer Khadi and an inner Khadi with a swing bridge for the use of country craft.

In the outer Khadi there is accommodation for 6 vessels and in the inner Khadi for 5 vessels.

7. Godowns for the storage of petroleum products.
8. A port and customs office building.
9. Several stacking platforms.
10. Passenger shed and amenities.
11. A sea wall extending from the breakwater upto 1,700 ft. on the west side, which gives protection to valuable state property.
12. 30 buildings *viz.*, office staff quarters, residential bungalows, workshop building etc.
13. Open storage area of 25,00,000 sq. ft.

(b) *Harbour craft*

1. 3 tugs.
2. Lighters of total capacity of 800 tons varying from 50 to 100 tons.
3. 2 Dredgers.
4. 2 Hopper barges.

(c) *Navigational aids*

1. A light is exhibited at an elevation of 56 ft. from a white octagonal tower 40 ft. in height, the range of light being 13 miles.
2. Bhidia Beacon light.
3. Storm warning signals.
4. Red buoy at the entrance for the guidance of launches and sailing vessels.

(d) *Cranes*

1. One 20 ton self-propelling steam crane used for heavy lifts and for lifting the gate of the dry dock.
2. One 4 ton travelling steam crane.
3. One 3 ton travelling steam crane.
4. One 1½ ton fixed steam crane.
5. One 1½ ton travelling steam crane.
6. One hand operated 5 ton fixed crane.

(e) *Workshop and workshop equipment*

A small workshop for annual repairs to the port flotilla and shore gear, is maintained by the port, and consists of:—

1. Machine shop.
2. Carpentry shop.
3. Moulding shop, and
4. Blacksmith shop.

The shops are equipped with:

1. Lathes
2. Drilling machines

3. Milling machines
4. Grinding machines
5. Portable compressor and welding sets
6. Rivetting hammer and rivet buster
7. Chipping hammers, and
8. Power driven saw.

17. *The Port of Porbunder*

(a) *Shore facilities*

1. Wharf wall is 5,100 ft. long. A part of this wall is used by the floating craft belonging to the port. Roughly 1,000 ft. out of this length is approach wall, which cannot be used for berthing. There are 14 ramps from the wharf wall alongside which country craft can be worked.
2. 24 transit sheds and godowns inclusive of two petrol godowns served by railways; total area roughly 50,000 sq. ft.
3. The Port Office, passenger shed, open stacking ground and timber pond.
4. Low level land was reclaimed to give open storage area of 15,00,000 sq. ft.
5. A medium size dry dock for the utility of port craft is under construction.

(b) *Harbour craft*

1. One non-propelling dipper dredger "PAVANKUMAR" with wooden hull in a poor condition with a 27 c. ft. dipper bucket and a spare bucket of 35.3 c. ft. capacity and rock breaker conical point of 6 tons.
2. One hopper barge of 100 tons capacity equipped with hand winch for operation of the 6 bottom doors.
3. One 120 H.P. single screw diesel tug "RAMDUT" with wooden hull 61′ × 18′ × 9′—3″.
4. One 60 H.P. single screw steaming "Maruti" with wooden hull 56′ × 13′ × 6′
5. One 350′ H.P. steam tug "NILBHADER" with single screw recently purchased from West Germany.
6. One 120 H.P. single screw light diesel tug "Hanuman" 50′ × 11′ × 5′ with wooden hull.
7. One 80 H.P. single screw, kerosene driven motor tug "SHAMROCK", 45′ × 10′ × 5′—1″ with wooden hull.
8. One Z.—craft "NAVYUG" with steel hull, diesel engine driven, twin screw, having capacity of 175 tons.
9. 19 wooden and steel barges.

(c) *Navigational aids*

1. Lighthouse exhibiting a light at an elevation of 101 ft. located on the sea face of Porbander town.

2. Two lights, vertically disposed, exhibited at elevations of 70 ft. and 73 ft. from a flag-staff in the grounds of the new palace.
3. A white stone beacon about half a mile south-eastward of the light house which aids ships approaching the anchorage for small vessels.
4. Storm signal station at Porbander.
5. Two red lights and three buoys in the approaches to the port for marking the channel and demarcating submerged outcrops.

(d) *Cranes*

1. Two 4 tons steam travelling cranes.
2. One 7 tons hand operated fixed crane.
3. Two 1 ton travelling hand-operated cranes.
4. One 2 tons travelling hand-operated crane.
5. One 1½ tons steam travelling crane.

(e) *Workshop and workshop equipment*

Medium sized workshop has been established in the Port Yard.

18. *The Port of Okha*

(a) *Shore facilities*

1. One handling pier 100′ in length providing one alongside deep water berth with 30′ depth of water. The other side of the pier is now being dredged to accommodate a second vessel.
2. Two stream moorings where vessels of 20′ and 16′ draught can be berthed.
3. 17 covered storage godowns with an area of 149.454 sq. ft. and 12,500 sq. ft. of semi-covered storage area.
4. A wharf for lighters 800′ in length, the bed level alongside being 3 ft. above L.W.O.S.T.
5. A masonry wharf about 600′ long for country craft.
6. Stacking place and open dumps inside the port estate having an area of 1,88,000 sq. ft.
7. One slipway for the purposes of lighters and port craft is under construction.

(b) *Harbour craft*

1. 15 steel barges.
2. One twin screw steel tug "Dharya" of 850 H.P.
3. One single screw "Tarac" diesel tug of 220 H.P.
4. Launch "Indira" of 75/110 H.P.
5. Launch "Usha" of 44 H.P.
6. Launch "Kuber" of 132 H.P.
7. Launch "Varuna" of 132 H.P.

(c) *Navigational aids*

1. A light is exhibited at an elevation of 110 ft. from a red steel framework situated on the coast northwest ward of Okha point.
2. A light is exhibited at an elevation of 31 ft. from a circular stone tower at Samiani Island.
3. A flag-staff for signalling.
4. A shoal located about 1½ miles north-west ward of Vomabi point is marked by a red conical buoy.
5. Samiani shoal marked at its South-eastern edge by a red conical buoy.
6. A red conical buoy marking foul ground in the western approach channel to the port betweeen the main land and Samiani Island.
7. A large shoal located about 1½ miles northward of Samiani Island marked by a black can buoy.
8. A reef which dries in places extending about 2 cables north-eastward of the north-eastern end of Samiani Island marked by a red beacon.
9. Foul ground northward of Beyt Island marked by a black one buoy.
10. Buoyed approach channel to the pier.
11. A red conical buoy marking a shoal 2½ cables east of the eastern end of the pier.
12. At times by temporary arrangements of lights, night navigation is being carried out.

(d) *Cranes*

1. One hand crane of 5 ton and one crane of 1 ton capacity.
2. Five cranes of 1 ton capacity each.
3. Two cranes of 3 ton capacity each.

(e) *Workshop and workshop equipment*

A medium sized workshop is located at the port to carry out repairs and maintenance of port fleet and other plants. The workshop equipment consists of:—

1. 2 Lathes
2. 2 Drilling machines
3. 1 Shaping machine
4. 1 Threading machine
5. 1 Shearing machine
6. 1 Electric hammer
7. 1 Electric welding plant
8. 1 Gas welding plant
9. 1 Smithy

NOTE.—The buoys required for Okha have been fabricated in this workshop in the past.

*19. *The Port of Sikka*

(a) *Shore facilities*

*1. A jetty 150′ long.

*2. An aerial ropeway.

*3. A dry dock for docking shallow draught barges.

4. Abundant waste land can be utilised as an open storage space.

(b) *Harbour craft*

The port does not possess any harbour craft.

(c) *Navigational aids*

Three wooden poles at Narara Siri Goose Reef edges.

(d) *Cranes*

No cranes are available.

(e) *Workshop and workshop equipment*

*Two workshops.

20. *The Port of Bedi*

(a) *Shore facilities*

1. Jagatjit Dock—A tidal basin with mud bottom which dries at low water springs, with quay walls of stone masonry.

2. East quay—992 ft. × 30 ft. wide, served by single loading track 919 ft. long. This can be plumbed by cranes.

3. West quay—800′ × 40′ served by 2 loading tracks 700 ft. each with single draw off and which can be plumbed by cranes.

4. A centre pier with 1400 ft. of quay, 80 ft. wide and having one loading siding 500 ft. with a single draw-off.

5. North quay—240 ft. long and 50 ft. wide, served by one 10 ton steam portal crane.

6. Country craft quay—On the east side of Jagatjit Dock constructed in stone masonry, length 850 ft. and of variable width, in two stretches at right angles and founded direct on shallow rock. The mud bottom in front of the quay is dry at low tides.

7. Oil berth—Situated on the north side of the Jagatjit Dock with quary walls of masonary. The mud bottom in front dries at low water springs. This berth is used for the discharge of edible oils.

8. Two dry docks and one barge basin—One dry dock is used by the Indian Navy and is provided with two pairs of mitre type gates so that it can either be used as a wet or dry dock. The other dry dock and barge basin are fitted with lifting type gates and are used for repairs to port craft.

*Owned by Messrs Digvijay Cement Co.

9. Transit sheds and godowns—Ample transit sheds and godowns with 7 transit godowns, 2 semi covered transit godowns, having an area of 93,126 sq. ft. and 3,033 sq. ft. respectively and in addition 14 storage godowns with a total area of 2,35,297 sq. ft.

(b) *Harbour craft*

1. One steel hopper barge 80′ × 18′ 7′.
2. A twin screw, 120 H.P. Diesel tug "Purna" 75′ × 16′ × 8′, speed 8 knots; towing capacity 600 tons.
3. A single screw steam tug "Theydon" of 60 H.P. 70 ft. × 14ft. 6″ × 8′, with a speed of 7 knots, and cargo towing capacity of 500 tons.
4. A twin screw petrol tug "Halari", 50 H.P. 70 ft. × 5ft. × 8ft., speed 6 knots and cargo towing capacity 400 tons.
5. A single screw diesel tug "Energy", 225 H.P. 44 ft. × 16ft.—4″ 5′.6″.
6. A twin screw petrol tug, "Saurashtra", 140 H.P., 42 ft.-6 inch. × 18 ft. × 6 feet.
7. A single screw diesel tug of 350 H.P. 47 ft. × 11 ft. × 5 ft.
8. A single screw steam tug of 350 H.P. recently purchased from west Germany.
9. 1 Launches, 29 lighters of 50 to 100 tons capacity and 2 self- 30ft.-9 inch. 8 ft.-6 inch.

(c) *Navigational aids*

1. A light is exhibited at an elevation of 44 ft. on Pirotan Island.
2. A light is exhibited at an elevation of 25 ft. from the detached reef about 2½ miles northward of Rozi Mata Light House.
3. A light at an elevation of 25 ft. about one mile north-west-ward of Rozi Mata Light House.
4. The Rozi Mata Light at an elevation of 48 ft. located on the courtyard of the Rozi Mata temple.
5. Storm signal station at Rozi Mata Light House.

(d) *Cranes*

1. 6 steam travelling cranes of 2½ ton capacity.
2. 2 steam travelling cranes of 3 ton capacity.
3. 1 steam travelling crane of 5 ton capacity.
4. 1 steam travelling crane of 10 ton capacity.
5. 1 steam derrick of 11 ton capacity.
6. 1 hand derrick of 1 ton capacity.
7. 1 three ton crane recently purchased.

(e) *Workshop and workshop equipment.*—The workshop is equipped sufficiently to carry out most of the repairs required for the port craft and shore gear.

APPENDIX VIII

Tonnage of Imports and Exports at the various ports from 1950-51 to 1959-60.

Port	Year	Imports in tons		Exports in tons		Total in tons		Total in tons
		Sailing craft	Steamers	Sailing craft	Steamers	Sailing craft	Steamers.	
Pradip	1958-59	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
	1959-60	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Kakinada	1950-51	739	1,543	651	63,633	1,390	65,176	6 6,566
	1951-52	910	23,636	1,004	77,357	1,914	1,00,993	1,02,907
	1952-53	832	19,416	315	69,521	1,147	88,937	90,084
	1953-54	223	15,329	1,532	1,38,750	1,755	1,54,079	1,55,834
	1954-55	369	4,469	871	3,21,729	1,240	3,26,198	3,27,438
	1955-56	1,662	1,632	1,539	3,62,539	3,201	3,64,171	3,67,372
	1956-57	1,648	2,800	873	3,77,054	2,521	3,79,854	3,82,375
	1957-58	166	34,929	597	3,10,638	763	3,45,567	3,46,330
	1958-59	N.A.	27,561	N.A.	1,46,962	N.A.	1,74,523	1,74,523
	1959-60	N.A.	44,368	N.A.	1,37,535	N.A.	1,81,903	1,81,903

N.A.=Not available.

Port	Year	Imports in tons		Exports in tons		Total in tons		Total in Tons
		Sailing craft	Steamers	Sailing craft	Steamers	Sailing craft	Steamers	
Masulipatnam	1950-51	N.A.	N.A.	N.A.	15,016	N.A.	15,016	15,016
	1951-52	N.A.	N.A.	N.A.	16,516	N.A.	16,516	16,516
	1952-53	5	N.A.	198	46,982	203	46,982	47,195
	1953-54	N.A.	N.A.	16,423	46,323	16,423	46,323	62,746
	1954-55	1	1	619	66,315	620	66,316	66,936
	1955-56	112	112	681	2,26,067	793	2,26,179	2,26,972
	1956-57	50	145	N.A.	2,70,817	50	2,70,962	2,71,012
	1957-58	N.A.	7,495	N.A.	3,44,051	N.A.	2,51,546	2,51,546
	1958-59	N.A.	11,020	N.A.	1,28,803	N.A.	1,39,823	1,39,823
	1959-60	N.A.	N.A.	N.A.	1,71,511	N.A.	1,71,511	1,71,511

N.A.=Not available.

Port	Year	Imports in tons		Exports in tons		Total in tons		Total in tons
		Sailing craft	Steamers	Sailing craft	Steamers	Sailing craft	Steamers	
Cuddalore	1950-51	360	1,09,709	492	69,759	852	1,79,468	1,80,320
	1951-52	1,505	91,547	4,133	42,879	5,638	1,34,426	1,40,064
	1952-53	940	1,88,113	12,123	13,733	13,063	2,01,846	2,14,909
	1953-54	1,043	1,69,778	7,179	34,882	8,222	2,04,660	2,12,882
	1954-55	662	1,78,499	3,165	33,766	3,827	2,12,265	2,16,092
	1955-56	601	1,96,828	6,408	6,460	6,761	2,03,288	2,10,049
	1956-57	889	1,76,826	4,196	400	5,085	1,77,226	1,82,311
	1957-58	570	2,58,737	3,999	9,171	4,569	2,67,908	2,72,477
	1958-59	N.A.	2,11,216	1,542	73,875	1,542	2,85,791	2,87,333
	1959-60	N.A.	1,78,731	131	2,36,782	286	4,15,513	4,15,799

N.A. = Not available.

Port	Year	Imports in tons		Exports in tons		Total in tons		Total in tons	Passenger Traffic		Total
		Sailing craft	Steamers	Sailing craft	Steamers	Sailing craft	Steamers		Embarked	Disembarked	
Nagapattinam	1950-51	93½	4,376	862	2,651¼	955½	7,027¼	7,982¾	10,123½	10,164½	20,288
	1951-52	35½	3,852½	3,273¼	6,429¼	3,308¾	10,287¾	13,596½	15,991½	13,551	29,542½
	1952-53	9½	7,336	4,478¾	6,747½	4,488	14,083½	18,571½	15,591½	9,410½	25,002
	1953-54	4	1,177¼	2,463½	3,024½	2,467½	4,201¾	6,669¼	9,517½	8,152	17,669½
	1954-55	4	9,038¼	3,598¾	4,993	14,031¼	3,602¾	20,634	11,741½	10,905½	22,647
	1955-56	238½	2,094	7,339	10,875¼	7,577½	12,969¾	20,547¼	12,722½	13,282	26,004½
	1956-57	57½	1,957½	5,489½	5,090	5,547	7,047½	12,594½	13,289	11,878½	25,167½
	1957-58	48	1,781	9,904	7,017¾	9,952	8,798¾	18,750	12,075½	6,709½	18,785
	1958-59	6½	1,927½	8,100½	7,566 plus 102 Bullocks	8,107	9,493½ plus 102 Bullocks	17,500 plus 102 Bullocks	11,266	14,212	25,478
	1959-60 (upto Feb. 60)	5¾	26,935¼	5,927	20,503¼ plus 126 Bullocks	5,932¾	47,438¾ plus 126 Bullocks	53,371½ plus 126 Bullocks	Not avalable.		

Port	Year	Imports in tons		Exports in tons		Total in tons		Total in tons	Passenger Traffic		Total
		Sailing craft	Steamers	Sailing craft	Steamers	Sailing craft	Steamers		Embarked	Disembarked	
Tuticorin	1950-51 . .	5,330	2,83,252	47,992	1,76,590	53,322	4,59,842	5,13,164	2,517	6,670	9,187
	1951-52 . .	5,930	2,55,319	56,992	1,77,779	62,922	4,33,098	4,96,020	1,573	3,774	5,347
	1952-53 . .	5,862	2,73,391	25,802	1,12,331	31,664	4,85,722	5,17,386	2,069	5,900	7,969
	1953-54 . .	5,834	2,47,625	28,531	1,76,970	34,365	4,24,595	4,58,960	511	912	1,423
	1954-55 . .	7,774	1,29,299	4,922	2,43,646	12,696	4,62,945	4,75,641	201	222	423
	1955-56 . .	10,972	2,47,000	62,772	2,46,715	73,744	4,93,715	5,67,459	365	893	1,258
	1956-57 . .	8,516	2,70,365	49,418½	2,59,086½	57,934½	5,28,451½	5,86,386	58	288	346
	1957-58 . .	6,398	2,78,189	74,560	3,41,009	80,958	6,19,198	7,00,156	75	122	197
	1958-59 . .	7,176	3,15,578	1,74,882½	2,88,984½	1,82,058½	6,04,562½	7,86,621	Not	Available.	
	1959-60 . .	8,518	3,21,441½	1,33,758½	3,47,439½	1,42,276½	6,68,881	8,11,157½	Not	Available.	

Port	Year	Imports in tons	Exports in tons	Total in tons	Passenger Traffic		Total
					Embarked	Disembarked	
Alleppey	1950-51 . .	777	31,124	31,901	Nil	Nil	
	1951-52 . .	1,304	17,053	18,357	Nil	Nil	
	1952-53 . .	845	22,447	23,292	Nil	Nil	
	1953-54 . .	486	20,816	21,302	Nil	Nil	
	1954-55 . .	651	19,806	20,457	Nil	Nil	
	1955-56 . .	537	19,117	19,654	Nil	Nil	
	1956-57 . .	2,920	23,525	26,445	Nil	Nil	
	1957-58 . .	293	22,376	22,669	Nil	Nil	
	1958-59 . .	536	41,764	42,300	Nil	Nil	
	1959-60 . .	6,687	30,210	36,897	Nil	Nil	

NOTE : Separate figures for Sailing Craft and Steamers not available.

Port	Year	Imports in tons	Exports in tons	Total in tons
Quilon	1950-51	N.A.	1,414	1,414
	1951-52	15,299	715	16,014
	1952-53	3,379	758	4,137
	1953-54	45,114	773	45,887
	1954-55	16,801	2,283	19,084
	1955-56	16,874	3,852	20,726
	1956-57	20,258	2,750	23,008
	1957-58	12,804	7,444	20,248
	1958-59	16,302	5,519	21,821
	1959-60	9,404	1,056	10,460
Koilthottam	1950-51	N.A.	148,317	148,317
	1951-52	N.A.	151,721	151,721
	1952-53	N.A.	150,575	150,575
	1953-54	N.A.	169,997	169,997
	1954-55	N.A.	195,625	195,625
	1955-56	N.A.	176,224	176,224
	1956-57	N.A.	288,650	288,650
	1957-58	N.A.	246,722	246,722
	1958-59	N.A.	240,320	240,320
	1959-60	N.A.	237,101	237,101

NOTE : Separate figures for Sailing Craft and Steamers not available.

Port	Year	Imports in tons		Exports in tons		Total in tons		Total in tons	Passenger Traffic		Total
		Sailing craft	Steamers	Sailing craft	Steamers	Sailing craft	Steamers		Embarked	Dis-embarked	
Baypore and Kozhikode.	1950-51 .	28,734	20,608	80,457	60,755	1,09,191	81,363	1,90,554	21	95	116
	1951-52 .	46,629	53,428	75,929	65,632	1,18,558	1,19,060	2,37,618	41	69	110
	1952-53 .	28,985	29,081	87,937	82,671	1,16,922	1,11,752	2,28,674	141	94	235
	1953-54 .	30,336	44,988	1,11,211	79,940	1,41,547	1,24,928	2,66,475	85	80	165
	1954-55 .	18,985	52,715	1,11,019	86,049	1,30,004	1,38,764	2,68,768	112	14	126
	1955-56 .	45,929	21,455	85,766	89,953	1,31,695	1,11,408	2,43,103	94	40	134
	1956-57 .	29,717	66,571	97,406	1,17,773	1,27,123	1,84,344	3,11,467	114	76	190
	1957-58 .	35,992	74,829	1,60,618	44,904	1,96,610	1,19,733	3,16,343	78	159	237
	1958-59 .	44,649	6,868	1,51,718	71,225	1,96,367	78,093	2,74,460	Not available		
	1959-60 . (up to Feb. end only)	32,507	6,900	1,41,536	62,539	1,74,043	69,439	2,43,482	Not available		

Port	Year	Imports in tons		Exports in tons		Total in tons		Total in tons	Passenger Traffic		Total
		Sailing crafts	Steamers	Sailing crafts	Steamers	Sailing crafts	Steamers		Embarked	Dis-embarked	
Mangalore	1950-51	68,561	12,717	1,87,143	23,379	2,55,704	36,069	2,91,800	8,471½	8,433½	16,905
	1951-52	56,958	10,624	1,45,283	25,257	2,02,241	35,881	2,38,122	8,111	9,025½	17,136½
	1952-53	64,976	11,680	1,70,778	24,084	2,35,754	35,764	2,71,518	9,603	8,656	18,259
	1953-54	71,481	13,916	1,11,695	20,168	1,83,176	34,084	2,17,260	7,195	6,975	14,170
	1954-55	50,080	13,328	1,72,838	21,903	2,22,918	35,231	2,58,149	7,482	7,678½	15,160½
	1955-56	73,570	8,483	1,85,651	16,183	2,59,221	24,666	2,83,887	7,152½	6,935	14,087½
	1956-57	59,191	12,481	1,80,205	16,247	2,39,396	28,728	2,68,124	5,728	5,864½	11,592½
	1957-58	78,623	9,477	1,80,629	30,274	2,59,252	39,751	2,99,003	6,974½	6,793	13,767½
	1958-59	71,691	8,187	1,59,868	58,510	2,31,559	66,697	2,98,256	7,026½	6,588	13,614½
	1959-60	63,813	8,077	1,82,855	1,80,700	2,46,668	1,88,777	3,35,445	7,442	7,343	14,785

Port	Year	Cargo traffic						Total of sailing craft and Steamers in tons	Passenger traffic		
		Imports in tons		Exports in tons		Total in tons			Embarked	Dis-embarked	Total
		Sailing crafts	Steamers	Sailing crafts	Steamers	Sailing crafts	steamers				
Karwar	1950-51	*2,590	N.A.	*488	N.A.	N.A.	N.A.	3,078	2,467	3,071	5,538
	1951-52	3,010	N.A.	694	N.A.	N.A.	N.A.	3,704	2,367	2,846	5,213
	1952-53	3,763	N.A.	509	N.A.	N.A.	N.A.	4,272	2,328	2,783	5,111
	1953-54	2,208	N.A.	714	N.A.	N.A.	N.A.	3,922	1,965	2,568	4,533
	1954-55	4,052	N.A.	792	N.A.	N.A.	N.A.	4,844	2,382	2,635	5,017
	1955-56	1,491	2,219	665	200	2,156	2,419	4,575	2,718	3,338	6,056
	1956-57	2,707	212	584	201	3,219	413	3,704	3,469	4,141	7,610
	1957-58	2,944	146	478	29,180	3,422	29,326	32,748	5,956	9,008	14,964
	1958-59	4,412	383	1,753	84,174	6,165	84,557	90,722	20,931	13,024	33,955
	1959-60	2,958	318	700	1,54,439	2,600	1,29,438	1,58,415	15,168	17,121	32,289

*Separate figures for sailing craft and steamers not available.

N.A.=Not available.

Port	Year	Imports in tons		Exports in tons		Total in tons		Total in tons
		Sailing craft.	Steamers	Sailing craft	Steamers	Sailing Craft	Steamers	
Redi	1950-51 .		*6,413	..	*5,093	..	*11,506	11,506
	1951-52 .	..	*2,914	..	*6,510	..	*9,424	9,424
	1952-53 .	..	*2,473	..	*2,337	..	*4,810	4,810
	1953-54 .	..	*3,127	..	*2,534	..	*5,661	5,661
	1954-55 .	..	*2,716	..	*11,427	..	*14,143	14,143
	1955-56 .	..	N.A.	..	N.A.	..	N.A.	N.A.
	1956-57 .	..	N.A.	..	N.A.	..	N.A.	N.A.
	1957-58 .	..	N.A.	..	N.A.	..	N.A.	N.A.
	1958-59 .	..	N.A.	..	1,40,808	..	1,40,808	1,40,808
	1959-60 .	..	N.A.	..	90,627	..	90,627	90,627

*Separate figures for sailing craft and steamers for the years 1950-51 to 1954-55 not available.
N.A. = Not available.

Port	Year	Imports in tons		Exports in tons		Total in tons		Total in tons	Passenger Traffic		
		Sailing craft	Steamers	Sailing craft	Steamers	Sailing craft	Steamers		Embarked	Dis-embarked	Total
Ratnagiri	1950-51 .	19,290	N.A.	4,280	N.A.	23,570	N.A.	23,570	1,23,730	1,23,730	2,47,460
	1951-52 .	19,176	N.A.	4,287	N.A.	23,463	N.A.	23,463	1,81,471	1,81,471	2,36,942
	1952-53 .	20,190	N.A.	5,160	N.A.	25,350	N.A.	25,350	1,20,882	1,20,882	2,41,764
	1953-54 .	29,996	N.A.	6,835	N.A.	27,381	N.A.	27,381	1,21,999	1,21,999	2,43,998
	1954-55 .	34,881	N.A.	6,719	N.A.	41,719	N.A.	41,719	1,22,597	1,22,597	2,45,194
	1955-56 .	19,706	N.A.	5,130	N.A.	24,836	N.A.	24,836	1,22,600	1,22,600	2,45,200
	1956-57 .	20,100	N.A.	12,330	N.A.	32,430	N.A.	32,430	75,726	70,656	1,46,382
	1957-58 .	19,796	N.A.	11,040	N.A.	30,836	N.A.	30,836	65,325	26,908	92,233
	1958-59 .	19,449	N.A.	5,360	N.A.	24,809	N.A.	24,809	Not Available.		
	1959-60 . (up to December, 59).	44,604	N.A.	3,059	N.A.	47,663	N.A.	47,663	Not available.		

N.A.=Not Available.

Port	Year	Imports in tons		Exports in tons		Total in tons		Total in tons
		Sailing Craft	Steamers	Sailing Craft	Steamers	Sailing Craft	Steamers	
Surat	1950-51	10,260		8,680		18,940		18,940
	1951-52	10,758		10,730		21,488		21,488
	1952-53	10,600		10,098		20,698		20,698
	1953-54	10,852		9,380		20,232		20,232
	1954-55	11,152		6,888		18,040		18,040
	1955-56	2,507		8,696		11,203		11,203
	1956-57	25,672		8,324		33,996		33,996
	1957-58	N.A.		N.A.		N.A.		N.A.
	1958-59	10,448		3,388		13,836		13,836
	1959-60	1,209		535		1,744		1,744

Note :—Separate figure for Sailing craft and Steamer not available.
N.A.=Not available.

Port	Year	Imports in tons		Exports in tons		Total in tons		Total in tons
		Sailing Craft	Steamers	Sailing Craft	Steamers	Sailing Craft	Steamers	
Broach	1950-51	17,699	N.A.	19,517	N.A.	37,216	N.A.	37,216
	1951-52	22,849	N.A.	16,339	N.A.	39,188	N.A.	39,188
	1952-53	16,754	N.A.	23,973	N.A.	40,727	N.A.	40,727
	1953-54	21,669	N.A.	21,075	N.A.	42,744	N.A.	42,744
	1954-55	27,216	N.A.	28,005	N.A.	55,221	N.A.	55,221
	1955-56	27,768	N.A.	31,460	N.A.	59,228	N.A.	59,228
	1956-57	27,364	N.A.	10,449	N.A.	37,813	N.A.	37,813
	1957-58	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
	1958-59	9,619	N.A.	8,100	N.A.	17,719	N.A.	17,719
	1959-60 (upto Nov. 59).	9,768	N.A.	6,400	N.A.	16,168	N.A.	16,168

N.A.—Not available.

Port	Year	Imports in tons		Exports in tons		Total in tons		Total in tons	Passenger Traffic		
		Sailing Craft	Steamers	Sailing Craft	Steamers	Sailing Craft	Steamers		Embarked	Dis-embarked	Total
Bhavnagar	1950-51	72,870	1,17,739	13,085	84,697	86,675	2,02,436	2,89,111	304	308	612
	1951-52	66,939	1,16,260	14,139	55,183	81,078	2,11,443	2,92,521	67	95	162
	1952-53	37,908	70,176	13,914	1,21,098	51,822	1,91,274	2,43,096	6	3	9
	1953-54	55,976	37,907	23,252	1,10,783	79,228	1,39,670	2,18,898	N.A.	N.A.	N.A.
	1954-55	65,912	1,38,348	28,991	77,418	94,903	2,15,766	3,10,669	N.A.	3	3
	1955-56	81,095	58,406	32,065	1,08,235	1,13,160	1,66,641	2,79,801	N.A.	N.A.	N.A.
	1956-57	57,935	33,746	30,159	1,53,912	88,094	1,87,658	2,75,752	N.A.	5	5
	1957-58	51,358	76,236	29,374	1,20,799	80,732	1,97,035	2,77,767	N.A.	6	6
	1958-59	53,243	43,075	37,336	95,297	90,579	1,38,372	2,28,951	N.A.	N.A.	N.A.
	1959-60 (upto Nov. 59).	33,265	24,562	17,811	94,489	1,27,754	42,373	1,70,127	N.A.	N.A.	N.A.

*N.A.—Not available.

Port	Year	Imports in tons		Exports in tons		Total in tons		Total in tons	Passenger Traffic		
		Sailing Craft	Steamers	Sailing Craft	Steamers	Sailing Craft	Steamers		Embarked	Dis-embarked	Total
Veraval	1950-51	49,539	19,241	33,873	6,865	81,412	26,106	1,07,518	N.A.	N.A.	2,709
	1951-52	42,813	37,759	31,962	2,075	74,775	39,834	1,14,609	N.A.	N.A.	1,762
	1952-53	35,157	17,671	52,882	5,120	88,099	22,791	1,10,830	N.A.	N.A.	1,338
	1953-54	55,262	11,481	75,908	4,415	1,31,170	15,896	1,47,066	N.A.	N.A.	1,351
	1954-55	66,834	21,492	71,389	15,700	1,38,223	37,192	1,75,415	N.A.	N.A.	1,704
	1955-56	61,358	4,807	61,897	19,613	1,23,255	24,520	1,17,775	N.A.	N.A.	N.A.
	1956-57	61,290	6,847	76,506	17,683	1,37,796	24,530	1,62,326	N.A.	N.A.	N.A.
	1957-58	61,037	5,204	68,511	31,233	1,29,548	23,437	1,52,985	N.A.	N.A.	N.A.
	1958-59	61,120	5,616	68,633	35,271	1,29,753	40,887	1,70,640	N. A.	N.A.	N.A.
	1959-60 (upto Nov. 59).	33,169	4,251	39,949	17,577	73,118	21,828	94,946	N.A.	N.A.	N.A.

N.A.—Not available.

Port	Year	Imports in tons		Exports in tons		Total in tons		Total in tons	Passenger Traffic		Total
		Sailing craft	Steamers	Sailing Craft	Steamers	Sailing Craft	Steamers		Embarked	Dis-embarked	
Porbander	1950-51	41,330	4,450	32,086	79,376	73,416	83,826	1,57,242	2,201	3,157	5,358
	1951-52	48,820	5,598	33,195	68,734	82,015	74,332	1,56,347	2,141	2,942	4,083
	1952-53	30,901	3,851	33,271	87,706	64,172	91,557	1,55,729	2,204	2,014	4,218
	1953-54	41,041	5,180	35,752	74,187	78,793	79,367	1,58,160	2,362	2,432	4,794
	1954-55	47,463	8,494	36,612	68,220	84,075	76,714	1,60,789	2,463	3,401	5,864
	1955-56	45,728	5,446	36,389	61,538	82,117	66,984	1,49,101	1,894	2,844	4,738
	1956-57	44,705	4,466	34,197	52,145	78,902	56,611	1,35,513	2,207	2,214	4,421
	1957-58	44,760	5,636	37,176	51,728	81,936	57,364	1,39,300	2,680	2,263	4,943
	1958-59	45,329	9,664	31,354	59,317	76,683	68,981	1,15,664	N.A.	N.A.	N.A.
	1959-60 (upto Nov. 1959).	18,842	4,583	14,146	24,916	32,988	29,499	62,487	N.A.	N.A.	N.A.

N.A.—Not available.

Port	Year	Imports in tons		Exports in tons		Total in tons		Total in tons	Passenger Traffic		
		Sailing Craft	Steamers	Sailing Craft	Steamers	Sailing Craft	Steamers		Embarked	Dis-embarked	Total
Okha . .	1950-51 .	3,762	1,83,818	27,034	1,53,573	30,796	3,37,391	3,68,187	N.A.	N.A.	N.A.
	1951-52 .	4,607	2,79,060	30,461	1,74,514	35,068	4,53,574	4,88,642	N.A.	N.A.	N.A.
	1952-53 .	4,689	2,10,991	24,331	1,64,022	29,020	3,75,013	4,04,033	N.A.	N.A.	N.A.
	1953-54 .	4,254	2,24,959	29,244	1,61,886	33,498	3,86,845	4,20,343	2,301	3,225	5,526
	1954-55 .	3,325	2,74,714	32,469	1,39,270	35,794	4,13,984	4,49,778	2,459	3,280	5,739
	1955-56 .	2,520	2,27,602	47,464	1,49,420	49,984	3,77,022	4,27,006	2,551	3,350	5,901
	1956-57 .	1,870	2,43,078	30,912	1,55,937	32,782	3,99,015	4,31,797	2,645	3,335	5,980
	1957-58 .	2,195	2,28,283	23,624	1,86,439	25,819	4,14,722	4,40,514	2,862	3,655	6,517
	1958-59 .	2,003	1,53,982	13,647	2,09,585	15,650	3,63,567	3,79,217	N.A.	N.A.	N.A.
	1959-60 . (upto Nov. 1959).	737	1,19,670	11,571	1,76,160	12,308	2,95,830	3,08,138	N.A.	N.A.	N.A.

N.A.=Not available.

Port	Year	Imports in tons		Exports in tons		Total in tons		Total
		Sailing craft	Steamers	Sailing craft	Stemaers	Sailing craft	Steamers	
Sikka	1950-51 .	1,435		43,388				44,823
	1951-52 .	1,422		52,499				53,921
	1952-53 .	4,400		53,017				57,417
	1953-54 .	2,089		1,01,104				1,03,193
	1954-55 .	3,204		1,25,297				1,28,501
	1955-56 .	4,755		87,464				92,219
	1956-57 .	3,878		1,16,749				1,20,627
	1957-58 .	2,334		1,70,726				1,73,060
	1958-59 .	2,869		1,59,391				1,62,260
	1959-60 (upto Sept. 1959). .	751		94,354				95,105

Note : Separate figures for Sailing Craft and steamers not available.

Port	Year	Imports in tons		Exports in tons		Total in tons		Total	Passenger Traffic		
		Sailing Craft	Steamers	Sailing Craft	Steamers	Sailing Craft	Steamers		Embarekd	Dis-embarked	Total
Bedi . . .	1950-51 .	17,997	37,767	13,464	1,00,564	31,461	1,38,331	1,69,792	N.A.	N.A.	2,167
	1951-52 .	23,972	47,733	14,294	1,28,457	38,266	1,76,191	2,14,456	N.A.	N.A.	1,921
	1952-53 .	12,277	51,742	14,519	1,65,447	26,796	2,17,189	2,43,985	N.A.	N.A.	1,532
	1953-54 .	18,711	21,798	16,792	2,39,525	35,503	2,61,323	2,96,828	N.A.	N.A.	1,227
	1954-55 .	23,670	36,570	24,641	2,08,451	48,311	2,45,021	2,93,332	N.A.	N.A.	1,177
	1955-56 .	20,340	35,222	19,071	2,74,539	39,411	3,09,761	3,49,172	N.A.	N.A.	N.A.
	1956-57 .	17,187	24,258	18,463	2,54,349	35,650	2,78,607	3,14,257	N.A.	N.A.	N.A.
	1957-58 .	16,004	30,200	14,926	2,34,487	30,930	2,64,687	2,95,617	N.A.	N.A.	N.A.
	1958-59 .	21,524	14,971	13,620	3,11,633	35,144	3,26,604	3,61,748	N.A.	N.A.	N.A.
	1959-60 (upto Nov. 59) .	10,753	9,152	5,918	2,13,016	16,671	2,22,168	2,38,839	N.A.	N.A.	N.A.

. :—Not available.

APPENDIX IX

Number and Nett Registered Tonnage of Steamers and Sailing Craft which visited the various ports from 1950-51 to 1959-60.

Port	Year	Sailing Craft		Steamers	
		No.	N.R.T.	No.	N.R.T.
Paradip	*1958-59		N.A		
	1959-60		N.A		
Kakinada	1950-51	16	2,464	95	3,34,844
	1951-52	24	3,685	109	3,65,383
	1952-53	18	2,054	117	3,48,285
	1953-54	16	2,428	123	4,08,533
	1954-55	14	1,729	136	4,38,428
	1955-56	20	3,454	136	4,56,752
	1956-57	14	2,369	110	3,57,790
	1957-58	3	406	118	4,46,896
	1958-59	N.A.	N.A.	133	4,80,190
	1959-60	25	1691	116	4,31,936
Masulipatnam	1950-51	11	1,385	3	7,212
	1951-52	22	2,702	7	14,592
	1952-53	8	888	9	28,925
	1953-54	7	828	7	24,595
	1954-55	9	1,118	11	45,317
	1955-56	42	2,576	32	1,10,191
	1956-57	16	663	35	1,33,090
	1957-58	11	506	39	1,46,321
	1958-59	N.A.	N.A.	24	1,06,333
	1959-60	N.A.	N.A.	34	1,40,193
Cuddalore	1950-51	87	3,835	46	1,26,788
	1951-52	189	9,794	40	1,12,538
	1952-53	190	14,066	42	1,39,427

*Paradip Port started functioning only from 1958-59.
N.A.-Not Available

Port	Year	Sailing Craft		Steamers	
		No.	N.R.T.	No.	N.R.T.
	1953-54 .	90	8,041	39	1,10,117
	1954-55 .	92	4,858	40	1,22,851
	1955-56 .	154	7,838	35	1,02,805
	1956-57 .	110	5,097	35	96,949
	1957-58 .	118	6,707	47	1,44,921
	1958-59 .	76	4,111	60	2,07,467
	1959-60 .	55	3,111	58	2,05,505
Nagapattinam . . .	1950-51 .	153	5,896	47	1,76,752
	1951-52 .	161	6,960	57	1,97,667
	1952-53 .	181	8,707	55	1,84,762
	1953-54 .	126	4,898	40	1,48,482
	1954-55 .	151	6,197	53	2,18,171
	1955-56 .	266	12,228	59	2,62,742
	1956-57 .	247	10,432	54	2,43,016
	1957-58	310	14,470	39	1,77,610
	1958-59 .	263	11,637	58	2,56,233
	1959-60 .	428	24,333	64	2,66,488
Tuticorin . . .	1950-51 .	473	41,138	423	7,16,049
	1951-52 .	575	51,276	401	5,76,092
	1952-53 .	579	50,806	548	6,38,723
	1953-54 .	419	41,277	522	7,47,121
	1954-55 .	565	54,822	459	6,61,080
	1955-56	733	71,146	587	5,90,943
	1956-57 .	696	57,644	563	6,14,546
	1957-58 .	975	83,309	508	6,45,607
	1958-59 .	1,429	1,36,170	464	8,66,834
	1959-60 .	1,347	1,52,856	606	10,45,891

Port	Year	Sailing Craft		Steamers	
		No.	N.R.T.	No.	N.R.T.
Kojlthottam	1950-51	5,151	7,069	37	161,047
	1951-52	13	1,544	29	119,959
	1952-53	16	1,705	30	131,068
	1953-54	23	3,486	27	10,972
	1954-55	36	10,661	32	125,290
	1955-56	44	6,105	28	116,857
	1956-57	68	8,610	42	170,664
	1957-58	40	4,529	37	147,198
	1958-59	23	2,934	35	148,870
	1959-60	18	2,286	31	130,265
Quilon	1950-51	9	313	22	86,498
	1951-52	5	459	9	36,076
	1952-53	13	678	11	43,566
	1953-54	15	757	32	82,831
	1954-55	9	201	14	58,169
	1955-56	25	1,230	20	83,757
	1956-57	15	807	13	48,364
	1957-58	11	1,127	18	69,795
	1958-59	13	204	17	70,003
	1959-60	2	239	4	15,179
Kozhikode & Beypore	1950-51	1,116	87,719	432	4,62,371
	1951-52	1,168	80,496	395	3,92,105
	1952-53	1,286	1,07,113	497	5,22,170
	1953-54	1,203	1,06,883	582	6,68,721
	1954-55	1,465	1,04,455	339	5,12,330
	1955-56	1,653	1,47,761	269	5,81,654
	1956-57	1,628	1,42,597	318	5,68,454
	1957-58	1,905	1,61,396	248	5,11,508
	1958-59	1,850	1,60,922	319	5,74,615
	1959-60	1,585	1,47,925	327	5,42,445

Port	Year	Sailing Craft		Steamers	
		No.	N.R.T.	No.	N.R.T.
Mangalore	1950-51	3,287	1,38,097	87	1,70,450
	1951-52	2,631	1,77,900	85	1,83,088
	1952-53	2,791	1,85,941	170	2,78,862
	1953-54	2,866	1,75,052	165	2,74,461
	1954-55	2,983	1,50,829	165	3,85,850
	1955-56	3,311	1,68,144	139	2,97,715
	1956-57	3,291	1,70,708	145	2,59,645
	1957-58	3,317	1,82,300	190	3,55,093
	1958-59	2,935	1,79,755	196	4,23,034
	1959-60 (upto Jan. 60)	3,270	1,91,902	232	5,06,893
Karwar	1950-51	591	4,158	70	1,13,120
	1951-52	662	20,572	70	1,13,120
	1952-53	619	38,582	70	1,13,120
	1953-54	567	51,364	72	1,16,352
	1954-55	624	40,488	72	1,16,352
	1955-56	701	22,284	67	1,08,272
	1956-57	575	16,004	64	98,124
	1957-58	694	26,077	67	1,17,679
	1958-59	481	21,679	565	1,63,937
	1959-60 (upto 31-1-60)	466	19,618	394	2,25,315
Reddi	1950-51	141	3,534	N.A.	1,520
	1951-52	151	4,139	N.A.	N.A.
	1952-53	138	3,418	N.A.	N.A.
	1953-54	97	2,503	N.A.	N.A.
	1954-55	106	2,425	1	4,101
	1955-56	....Not Available....			
	1956-57	Do.			
	1957-58	Do.			
	1958-59	Do.			
	1959-60	Do.			

Port	Year	Sailing Craft		Steamers	
		No.	N.R.T.	No.	N.R.T.
Ratnagiri	1950-51	715	21,450	N.A.	N.A.
	1951-52	672	20,160	N.A.	N.A.
	1952-53	869	25,070	N.A.	N.A.
	1953-54	845	25,350	N.A.	N.A.
	1954-55	732	21,960	N.A.	N.A.
	1955-56	1,122	32,571	709	1,99,735
	1956-57	1,125	31,792	749	1,98,200
	1957-58	1,001	30,277	702	1,95,704
	1958-59	900	29,007	488	1,23,438
	1959-60	522	19,290	306	8,341
Surat	1950-51	715	21,450	..	N.A.
	1951-52	672	20,160	..	Do.
	1952-53	869	25,070	..	Do.
	1953-54	845	25,350	..	Do.
	1954-55	732	21,960	..	Do.
	1955-56	..	..	..	Do.
	1956-57	..	..	..	Do.
	1957-58	..	..	..	Do.
	1958-59	472	15,113	..	Do.
	1959-60 (upto December 1959)	231	7,082	..	Do.
Bhavnagar	1950-51	1,065	17,399	Nil	Nil
	1951-52	1,008	22,567	Nil	Nil
	1952-53	1,082	16,430	Nil	Nil
	1953-54	990	21,369	Nil	Nil
	1954-55	1,052	26,966	Nil	Nil
	1955-56	N.A.	N.A.	N.A.	N.A.
	1956-57	Do.	Do.	Do.	Do.
	1957-58	Do.	Do.	Do.	Do.
	1958-59	753	18,566	Nil	Nil
	1959-60	425	9,406	Nil	Nil

N.A.—Not available.

Port	Year	Sailing Craft		Steamers	
		No.	N.R.T.	No.	N.R.T.
Bhavnagar	1950-51	2,735	75,246	96	1,85,932
	1951-52	2,523	79,528	87	1,37,734
	1952-53	1,901	50,601	93	1,56,312
	1953-54	2,389	64,077	87	1,65,078
	1954-55	2,521	74,727	102	1,85,704
	1955-56	3,088	89,146	95	1,94,667
	1956-57	2,311	70,118	110	1,96,579
	1957-58	2,147	70,802	123	2,63,098
	1958-59	2,128	57,784	149	3,49,697
	*1959-60	1,004	31,979	71	1,62,120
Veraval	1950-51	759	24,217	144	1,11,750
	1951-52	832	24,753	133	1,36,542
	1952-53	644	17,464	122	1,20,560
	1953-54	757	31,426	100	80,207
	1954-55	644	19,112	71	52,252
	1955-56	1,613	97,316	85	67,780
	1956-57	1,518	98,354	87	70,723
	1957-58	1,537	1,00,406	111	1,24,922
	1958-59	1,531	1,04,564	125	1,93,688
	*1959-60	574	42,678	42	68,241
Porbandar	1950-51	976	61,578	99	2,30,171
	1951-52	1,088	73,028	97	1,74,115
	1952-53	728	48,329	99	1,61,283
	1953-54	859	59,664	106	1 [illegible]859
	1954-55	895	57,206	114	1,89,304
	1955-56	837	62,388	91	1,58,458
	1956-57	804	60,095	81	1,49,939
	1957-58	783	59,800	110	2,02,694
	1958-59	799	60,723	129	2,92,968
	*1959-60	244	17,357	314	58,726

*Upto September, 1959.

Port	Year	Sailing Craft		Steamers	
		No.	N.R.T.	No.	N.R.T.
Okha	1950-51 .	521	17,487	174	5,27,928
	1951-52 .	626	19,584	208	3,94,015
	1952-53 .	829	29,648	232	4,46,994
	1953-54 .	955	49,007	237	5,43,966
	1954-55 .	1,331	53,957	246	6,32,058
	1955-56 .	1,524	68,819	205	4,44,867
	1956-57 .	1,081	48,546	239	5,21,901
	1957-58 .	921	43,179	241	5,26,511
	1958-59 .	660	29,570	242	4,39,673
	*1959-60	273	13,006	115	2,16,877
Sikka	1950-51 .	240	11,698	14	31,248
	1951-52 .	217	11,030	28	33,97.
	1952-53 .	217	8,678	32	47,93(
	1953-54 .	426	20,584	41	58,415
	1954-55 .	324	15,066	58	71,305
	1955-56 .	374	17,234	51	69,330
	1956-57 .	286	10,198	55	52,224
	1957-58 .	180	8,145	70	68,605
	1958-59 .	192	8,846	62	89,689
	*1959-60 .	N.A.	N.A.	31	48,172
Bedi	1950-51 .	1,238	68,523	138	4,15,584
	1951-52 .	1,345	76,875	139	2,94,349
	1952-53 .	1,229	55,702	153	3,28,977
	1953-54 .	1,499	72,441	176	3,85,197
	1954-55 .	1,587	78,734	245	4,54,231
	1955-56 .	955	42,161	151	3,37,248
	1956-57 .	754	37,145	155	3,16,923
	1957-58 .	695	31,684	156	3,80,439
	1958-59 .	778	39,118	170	4,59,980
	*1959-60 .	272	10,809	104	2,97,12(

*Upto September, 1959.

APPENDIX X

Recommended Development Works of the various Ports and Priorities at each Port.

Sl. No.	Port	Name of work	Estimated amount	Probable expenditure during third Plan	Remarks
			Rs.	Rs.	
		ORISSA			
1	Paradip	*First Priority.*			
		(*i*) Investigations	1,00,000	1,00,000	
		(*ii*) Model Study	1,00,000	1,00,000	
		(*iii*) Lighterage wharf 1600 ft. @ Rs. 1000/- per ft.	16,00,000	16,00,000	
		(*iv*) 2 Nos. two ton mobile cranes @ Rs. 90,000/- each	1,80,000	1,80,000	
		(*v*) 18 Nos. 100-ton lighters @ Rs. 1 lakh each	18,00,000	18,00,000	
		(*vi*) Ore tubs and nets	2,88,000	2,88,000	
		(*vii*) Platform cars and trolly track	2,60,000	2,60,000	
		(*viii*) 3 Nos. 300 H.P. towing tugs at Rs. 4 lakhs each.	12,00,000	12,00,000	
		(*ix*) Staff Quarters	5,50,000	5,50,000	
		(*a*) 5 Nos. officers Qrs. at Rs. 30,000/- each Rs. 1·5 lakhs.			
		(*b*) 15 Nos. class III Qrs. @ Rs. 10,000/- each Rs. 1·5 lakhs.			
		(*c*) 50 Nos. class IV Qrs. @ Rs. 5,000/- each Rs. 2·5 lakhs.			
		TOTAL . Rs. 5·5 lakhs			
		(*x*) Port and customs office	1,00,000	1,00,000	
		(*xi*) Water supply including one 6" tube well, over-head tank and pumphouse	1,25,000	1,25,000	
		(*xii*) Electrification	1,00,000	1,00,000	

Sl. No.	Port	Name of work	Estimate amount	Probable expenditure during third Plan	Remarks
			Rs.	Rs.	
		(*xiii*) Navigational aids :	2,40,000	2,40,000	
		(*a*) 4 lighted buoys @ Rs. 20,000 each Rs. 80,000 (*b*) 8 unlighted buoys @ Rs. 15,000/- each Rs. 1,20,000 (*c*) 4 beacons @ Rs. 10,000 each . Rs. 40,000 Rs. 2,40,000			
		(*xiv*) Roads in port estate 4 miles . . .	3,00,000	3,00,000	
		(*xv*) Acquisition of land .	1,00,000	1,00,000	
		(*xvi*) Reclamation including levelling and filling .	4,00,000	4,00,000	
		(*xvii*) Workshop and slipway	5,00,000	5,00,000	
		(*xviii*) 12" cutter suction dredger for internal dredging .	10,00,000	10,00,000	
		(*xix*) Water-*cum*-fuel barge .	2,00,000	2,00,000	
		(*xx*) Transit shed 120' × 30' .	50,000	50,000	
		(*xxi*) Construction of watering jetty . . .	38,000	38,000	
		(*xxii*) Construction of road bridge across Attarbanki Creek 500' × 22'.	5,00,000	5,00,000	
		(*xxiii*) Stacking yard for iron ore . . .	1,50,000	1,50,000	
		TOTAL, say, Rs. .	99,00,000	99,00,000	
		Second Priority			
		(*i*) 2 Nos. two ton mobile cranes @ Rs. 90,000/- each	1,80,000	1,80,000	
		(*ii*) 18 Nos. 100-ton lighters @ Rs. 1 lakh each . . .	18,00,000	18,00,000	
		(*iii*) 3 Nos. 300 H. P. towing . tugs @ Rs. 4 lakhs each. .	12,00,000	12,00,000	
		(*iv*) Staff Quarters :	15,50,000	15,50,000	
		(*a*) 5 Nos. Officers Qrs. @ Rs. 30,000 each 1,50,000 (*b*) 15 Nos. Class III Qrs, @ Rs. 10,000/- each 1,50,000 (*c*) 250 Nos. Class IV Qrs. @ Rs. 5,000/- each 12,50,000 TOTAL Rs. 15,50,000			

Sl. No.	Port	Name of work	Estimated Amount	Probable expenditure during Third Plan	Remarks
			Rs.	Rs.	
		(*v*) Small field Hospital .	2,00,000	2,00,000	
		(*vi*) Electrification . .	1,00,000	1,00,000	
		(*vii*) Improvements to roads in port estate . .	2,00,000	2,00,000	
		(*viii*) Expansion of workshop facilities . . .	3,00,000	3,00,000	
		TOTAL .	55,30,000	55,30,000	
		ANDHRA PRADESH			
2	Kakinada	*First Priority.*			
		(*i*) Development of loading hard area for handling grains and fertilisers. . .	3,00,000	3,00,000	
		(*ii*) Extension of groynes .	8,00,000	8,00,000	
		(*iii*) Acquisition of a new 12" cutter suction dredger .	10,00,000	10,00,000	
		(*iv*) *Navigational aids.*	1,75,000	1,75,000	
		(*a*) 3 Nos. flashing buoys @ Rs. 50,000/- each 1,50,000			
		(*b*) Radar reflector at Godavari Point 25,000			
		1,75,000			
		(*v*) Construction of 3 R. C. C. 'T' headed jetties for iron ore . . .	1,25,000	1,25,000	
		(*vi*) Acquisition of floating dock area for use as fish-*cum*-ore dock. . .	1,00,000	1,00,000	
		TOTAL . .	25,00,000	25,00,000	
		Second Priority.			
		(*i*) One grab dredger with two hopper barges of 100-ton capacity.	5,00,000	5,00,000	
		(*ii*) Staff quarters :		2,00,000	2,00,000
		(*a*) 9 Qrs. for class III . . Rs. 72,000			
		(*b*) 20 Qrs. for class IV Rs. 1,00,000			
		(*c*) Amenities for labour . Rs. 25,000			
		TOTAL Say Rs. 2,00,000			

Sl. No.	Port	Name of work	Estimated Amount	Probable expenditure during Third Plan	Remarks
			Rs.	Rs.	
		(*iii*) Reconditioning of tug 'Godavari' and the conversion of the M.F.V. as a despatch vessel . . .	2,00,000	2,00,000	
		TOTAL . .	9,00,000	9,00,000	
3.	Masulipatnam	*First Priority*.			
		Stabilising the channel at Masulipatnam including earthen bunds and strengthening of sand spit.	17,00,000	15,00,000	Rs. 2 lakhs will be spent during second Plan for provisions exists.
		TOTAL . .	17,00,000	15,00,000	
		Second Priority.			
		(*i*) Revetment of channel .	2,00,000	2,00,000	
		(*ii*) Ore stacking area near bar . . .	1,00,000	1,00,000	
		(*iii*) Providing approach road and bridge to the new Stacking area . .	5,60,000	5,60,000	
		(*iv*) Conversion of S. D. 'Akhanda Godavari' to oil firing. . . .	2,00,000	2,00,000	
		(*v*) Construction of a slipway and provision of essential workshop equipment .	3,00,000	3,00,000	
		(*vi*) Quarters for staff . (*a*) 2 Nos. class III Qrs. @ Rs. 8,000 . Rs. 16,000	1,20,000	1,20,000	
		(*b*) 17 No. class II Qrs. Rs. 5,000 Rs. 85,000			
		(*c*) Land acquisition Rs. 1,21,000 or Say . 1,20,000			
		TOTAL . .	14,80,000	14,80,000	

Sl. No.	Port	Name of work	Estimated amount	Probable expenditure during Third Plan	Remarks
			Rs.	Rs.	
		MADRAS			
4.	Cuddalore	. *First Priority.*			
		(*i*) Training works . .	10,00,000	10,00,000	
		(*ii*) Construction of break water about 2000′ @ Rs. 2,000 per feet.	40,00,000	40,00,000	
		TOTAL Rs. .	50,00,000	50,00,000	
		Second Priority			
		(*i*) Capital dredging L. S. .	4,00,000	4,00,000	
		(*ii*) Construction of R.C.C. wharf wall on two sides of Spoil Island . . .	7,00,000	7,00,000	
		(*iii*) Concreting the stacking area on north, central and south wharves. . .	50,000	50,000	
		(*iv*) Electrification of Spoil Island . . .	10,000	10,000	
		(*v*) Inspection-cum-survey launch . . .	1,00,000	1,00,000	
		(*vi*) 50 ton steel water barge with equipment . .	80,000	80,000	
		(*vii*) Provision of a 2 ton mobile crane . . .	1,00,000	1,00,000	
		(*viii*) Reconstruction of 1000 ft. of wharf . . .	4,00,000	4,00,000	
		(*ix*) Purchase of a grab dredger with necessary punts .	3,10,000	3,10,000	
		(*x*) Provision of a 300 H.P. tug for towing lighters .	4,50,000	45,0,000	
		(*xi*) Providing navigational aids such as lighted beacon & lighted buoys for night work . . .	1,10,000	1,10,000	
		(*xii*) Provision of quarters for port staff . . .	1,30,000	1,30,000	
		(*a*) 1 No. Class II Qrs. Rs. 15,000			
		(*b*) 6 Nos. Class III Qrs. @ Rs. 7,000 each Rs. 42,000			
		(*c*) 12 Nos. Class IV Qrs. @ Rs. 5,000 each . 60,000			
		(*d*) Land acquisition 10,000			
		TOTAL : Say . 1,30,000			
		TOTAL . . .	28,40,000	28,40,000	

Sl. No.	Port	Name of work	Estimated amount	Probable expenditure during Third Plan	Remarks
		Third Priority.			
		(*i*) Purchase of 12″ seagoing cutter suction dredger with pipeline . . .	20,00,000	20,00,000	Provisional requirement at Cuddalore if a ful time dredger is found necessary from experience
		(*ii*) Extension of dry dock .	3,00,000	3,00,000	Do.
		TOTAL : . .	23,00,000	23,00,000	
5.	Nagapattinam .	*First Priority.*			
		Construction of a reinforced concrete jetty with needle piles and mobile sand pump . . .	10,00,000	10,00,000	
		TOTAL	10,00,000	10,00,000	
		Second Priority			
		(*i*) Reconstruction of wharf wall (southern end) .	1,80,000	1,80,000	
		(*ii*) Improvement to the timber wharf including revetment etc. . . .	2,00,000	2,00,000	
		(*iii*) Construction of transit sheds in timber wharf area	50,000	50,000	
		(*iv*) Reconstruction of Passenger sheds . . .	2,50,000	2,50,000	
		(*v*) Joining up the 2 ramps in Central and south wharf (120 ft.) . . .	70,000	70,000	
		(*vi*) Slipway for dredger and tug . . .	1,50,000	1,50,000	
		(*vii*) Provision of 100 H. P. tug for towing passenger lighters . . .	1,50,000	1,50.000	
		(*viii*) Provision of quarters for Port Staff			
		(*a*) 7 Nos. class III Qrs. @ 13,000 Rs. 91,000			
		(*b*) 12 Nos. class IV Qrs. @ 4,000 Rs. 48,000			
		(*c*) Land Acquisition, water supply & electricity . Rs. 26,000			
		. 1,65,000			
		TOTAL . . .	12,15,000	12,15,000	

Sl. No.	Port	Name of work	Estimated amount	Probable expenditure during Third Plan	Remarks
			Rs.	Rs.	
		Third Priority.			
		(*i*) Provision of a small. Suction dredger . .	6,00,000	6,00,000	
		(*ii*) Improving the intensity of the light house . .	1,00,000	1,00,000	
		TOTAL . . .	7,00,000	7,00,000	
6.	Tuticorin	*First Priority.*			
		(*i*) Purchase of one 300 H.P. diesel tug . . .	5,00,000	5,00,000	
		(*ii*) Two 2-ton mobile cranes (20′ radius) diesel . .	1,50,000	1,50,000	
		(*iii*) 2 1/2 cubic yard dumb grab dredger . . .	5,00,000	5,00,000	
		(*iv*) 3 Mudpunts with wooden hull (100 tons capacity) .	2,50,000	2,50,000	
		(*v*) 3 Nos. 300-ton dumb barges . . .	5,00,000	5,00,000	
		(*vi*) One dumb barge with reclamation and diluting pumps and pipeline .	3,00,000	3,00,000	
		(*vii*) Construction of slipway for port-craft . .	2,00,000	2,00,000	
		(*viii*) Workshop, Equipment etc. . . .	2,00,000	2,00,000	
		(*ix*) Removal of 'Galatia' wreck . . .	1,00,000	1,00,000	
		TOTAL. . .	27,00,000	27,00,000	
		Second Priority.			
		(*i*) Reconditioning of dredger 'Tuticorin' and extension of ladder . . .	5,00,000	5,00,000	
		(*ii*) Construction of staff quarters : . . .	4,50,000	4,50,000	
		(*a*) Class I—Nil .			
		(*b*) Class II—3 Nos. 45,000			
		(*c*) Class IIIA 3 Nos. 39,000			
		(*d*) Class IIIB 26 Nos. . 1,82,00			
		(*e*) Class IV 45 Nos. 1,80,000			
		TOTAL Say Rs. 4,50,000*			
		TOTAL Rs. . .	9,50,000	9,50,000	

Sl. No.	Port	Name of work	Probable expenditure during Third Plan		Remarks
		KERALA			
7.	Neendakara.	*First Priority.*			
		(*i*) Construction of breakwaters at Neendakara .	44,00,000	44,00,000	
		(*ii*) Dredging . . .	2,00,000	2,00,000	
		(*ii*) Extension of railway siding	1,00,000	1,00,000	
		(*iv*) Construction of a wharf at Quilon near the additional rest house . .	3,00,000	3,00,000	
		(*v*) Construction of transit sheds at Quilon near proposed wharf . . .	2,50,000	2,50,000	
		(*vi*) Dredging of Ashtamudi lake from Quilon jetty to Neendakara . . .	2,00,000	2,00,000	
		(*vii*) Widening and deepening of Chavara canal connecting Koilthotam to Ashtamudi lake and dredging in lake to the channel L.S.	5,00,000	5,00,000	
		(*viii*) Installation of buoys for marking ships anchorage .	1,00,000	1,00,000	
		(*ix*) Administration building, signal station and quarters	1,00,000	1,00,000	
		(*xi*) Electricity and water supply . . .	1,00,000	1,00,000	
		(*x*) 30 Nos. 50 to 60 ton wooden lighters for Koilthotam at Rs. 30,000/- each	9,00,000	9,00,000	
		(*xii*) 3 Nos. 150 H.P. tugs at Rs. 1.75 lakhs each .	5,25,000	5,25,000	
		(*xiii*) Six wooden lighters of 50 to 60 ton capacity for Quilon traffic at Rs. 30,000 each . . .	1,80,000	1,80,000	
		(*xiv*) One No. 150 H.P. tug for Quilon. . . .	1,75,000	1,75,000	
		(*xv*) 1 Nos. 12′ cutter suction dredger for capital and maintenance dredging .	8,00,000	8,00,000	
		(*xvi*) Slipway and workshop	3,85,000	3,85,000	
		(*xvii*) Additional field offices at Koilthotam & Quilon .	30,000	30,000	
		TOTAL Say . .	92,50,000	92,50,000	

Sl. No.	Port	Name of work	Estimated amount	Probable expenditure during Third Plan	Remarks
			Rs.	Rs.	
8.	Beypore	*First Priority.*			
		(*i*) Construction of jetty for sailing craft 500 ft. × 60 ft. including aquisition of land and electrification of wharf	13,56,000	9,00,000	The balance is expected to be spent in Second Plan.
		(*ii*) Investigations & model study for an all-weather port	1,00,000	1,00,000	
		TOTAL	14,56,000	10,00,000	
		Second Priority.			
		(*i*) 3 Nos. fixed electric wharf cranes (one 5-ton and two 2-ton)	3,00,000	3,00,000	
		(*ii*) Water supply	50,000	50,000	
		(*iii*) Transit sheds 150′ × 30′	54,000	54,000	
		(*iv*) 150 H.P. diesel tug for towing tugs and country craft	2,00,000	2,00,000	
		(*v*) Workshop equipment	1,60,000	1,60,000	
		(*vi*) Staff quarters.	3,14,000	3,14,000	
		(*a*) Class I—1 No. 40,000			
		(*b*) Class III-17 Nos. 1,70,000			
		(*c*) Class IV—9 Nos. 54,000			
		(*d*) Land acquisition (2 1/2 acres) 50,000			
		3,14,000			
		TOTAL	10,78,000	10,78,000	
9.	Kozhikode	*First Priority*			
		(*i*) Provision of fixed electric wharf cranes on north and south piers.	10,00,000	10,00,000	
		(*a*) *North Pier*—2 Nos. 5-ton cranes at 10′ radius; one No. 2-ton crane at 20′ radius.			

Sl. No.	Port	Name of work	Estimated amount	Probable expenditure during Third Plan	Remarks
			Rs.	Rs.	
		(*b*) *South Pier.*			
		Six Nos. 2-ton cranes at 20′ radius, One No. 5 ton crane at 10′ radius at approximately each.	1,00,000		
		TOTAL .	10,00,000	10,00,000	
		Second Priority			
		(*i*) Construction of transit shed at south pier 150′×30′ .	54,000	54,000	
		(*ii*) Two Nos. 1-ton electric capstans for hauling rollies at south and north piers .	15,000	15,000	
		(*iii*) Additional stacking area at North pier 400×100 (including 600′ of shallow sea wall at Rs. 500/- per ft.)	3,50,000	3,50,000	
		(*iv*) Construction of signal station .	30,000	30,000	
		TOTAL say .	4,50,000	4,50,000	
10.	General.				
		First Priority.—			
		(*i*) Dredger for internal dredging at intermediate and minor ports	20,00,000	20,00,000	
		(*a*) 2-ton grab dredger Rs. 6 lakhs	Rs.		
		(*b*) 3 Nos. 100-ton hopper barges 3 lakhs			
		(*c*) 1 No. 200 HP tug. . 3 lakhs			
		(*d*) 1 No. 12′ cutter suction dredger 8 lakhs			
		TOTAL 20 lakhs	20,00,000	20,00,000	
		MYSORE			
11.	Mangalore				
		First Priority			
		(*i*) Provision of a new light house	1,50,000	1,50,000	Rs. 30,000 will be spent during second Plan.
		(*ii*) Extension of workshop facilities	1,60,000	1,30,000	

Sl. No.	Port	Name of work	Estimated amount	Probable expenditure during Third Plan	Remarks
			Rs.	Rs.	
		(*iii*) Beach protection and wind screen with casurina plantation on sand spit on 100 ft. wide belt, length about 1 mile . .	25,000	25,000	
		(*iv*) Timber, firewood and hay wharf at Khadathapalli and reclamation 400 ft. in length	4,00,000	4,00,000	
		(*v*) Investigations for development of Mangalore into an all-weather port . . .	1,00,000	1,00,000	
		(*vi*) Extension of northwharf for iron ore .	11,00,000	8,50,000	This is an item already included in 2nd Plan on which Rs. 2·5 lakhs are expected to be spent during current plan.
		(*vii*) Provision of a 300 H.P. tug. .	5,00,000	5,00,000	
		(*viii*) Provision of a 100 HP launch . .	1,50,000	1,50,000	
		(*ix*) 1 No. 2-ton mobile crane . .	1,00,000	1,00,000	
		(*x*) Replacing channel marking buoys with lighted buoys	1,25,000	1,25,000	
		TOTAL SAY	28,00,000	25,30,000	
12.	Karwar.				
		First Priority—			
		(*i*) Provision of lighterage wharf 1000 ft. in length including dredging alongside and in the approach channel to a depth of 8′ below L.W.O.S.T. @ Rs. 1960′-per l.f.t..	19,60,000	19,60,000	
		(*ii*) Provision of repair facilities including slipway & workshop	3,90,000	3,90,000	
		(*iii*) Provision of Pilot launch . .	1,50,000	1,50,000	
		TOTAL Rs. .	25,00,000	25,00,000	
		Second Priority—			
		(*i*) Provision of a transit shed 200′ × 50′ .	1,00,000	1,00,000	
		(*ii*) Provision of water barge with pump and shore installations for supplying water to ships	1,00,000	1,00,000	
		(*iii*) Provision of 150 HP diesel tug for harbour service, towage of passenger boats and sailing craft and for inspection purposes	2,50,000	2,50,000	
		(*iv*) Navigational aids	30,000	30,000	
		(*a*) Improvement to Koney light .	10,000		
		(*b*) Two leading lights at Shimshigudh and Kurmagad Isles	20,000		
			30,000		

Sl. No.	Port	Name of work	Estimated amount	Probable expenditure during Third Plan	Remarks
			Rs.	Rs.	
		(*v*) Provision of quarters for staff .	2,95,000	2,95,000	
		(*a*) 1 No. Class I officers Qr. .	37,000		
		(*b*) 1 No. class II officers Qr. .	21,000		
		(*c*) 10 Nos. Class III Qr. . . .	96,000		
		(*d*) 30 Nos. Class IV Qrs. . .	1,20,000		
		(*e*) Land acquisition . . .	21,000		
			2,95,000		
		(*vi*) Extension of office building . .	25,000	25,000	
		(*vii*) Provision of 2 mooring buoys .	1,50,000	1,50,000	
		(*viii*) Experimental dredging . . .	2,00,000	2,00,000	
		(*ix*) Land acquisition for future major expansion at Karwar	20,00,000	20,00,000	
		(*x*) Dredging approach channel, turning basin and mooring area opposite the existing wharf for 30 ft. steamers	49,03,860	49,03,860	This work to be taken up only after traffic exceeds 5 lakh tons per annum there is economic justification for further development
		(*xi*) Provision of channel marks. .	6,00,000	6,00,000	-do-
		(*a*) fairway buoy 1 No . . .	1,00,000		
		(*b*) Channel marking buoys 10 Nos. @ 50,000 each	5,00,000		
			6,00,000		
		(*xii*) Provision of 2 tugs 1000 B. H. P. and 700 B. H. P. for maneouvring of vessels	34,00,000	34,00,000	-do-
		(*xiii*) Provision of one mooring berth for ocean going steamers including heave up boat for anchors	2,50,000	2,50,000	-do-
		(*xiv*) Navigational aids	2,00,000	2,00,000	-do-
		(*a*) Lighted buoy for Parker rock 1 No.	50,000		
		(*b*) Lighted buoy for Marriot rock 1 No.	50,000		
		(*c*) Lighted buoy to mark Gudsav Sanv 1 No.	50,000		
		(*d*) Lighted beacon on rock awash bearing 098) distance 4900 ft from dyster Rock light House	50,000		
			2,00,000		
		(*xv*) Diversion of the present main road alongside port wharf and improvement of Binge-Karwar road as an alternative L S. . . .	4,00,000	4,00,000	-do-
		(*xvi*) Electrification and water supply L. S.	2,00,000	2,00,000	

Sl. No.	Port	Name of work	Estimated amount	Probable expenditure during Third Plan	Remarks
			Rs.	Rs.	
		(*xvii*) Provision of one ocean going steamer berth 600′ at Rs. 5000/- per ft. .	30,00,000	30,00,000	
		(*xviii*) Additional dredging alongside ocean going steamer berth . .	38,400	38,000	
		TOTAL—SAY .	1,61,40,000	161,41,860 or say 1,61,40,000	
13.	GENERAL				
		First Priority			
		(*i*) Dredger for internal dredging of various minor intermediate ports including auxiliary craft . . .	10,00,000	7,50,000	This is an item included in the 2nd Plan. An expenditure of Rs. 2·5 lakhs is expected in 2nd Plan.
		(*ii*) Preliminary investigations	1,00,000	1,00,000	
		(*ii*) Tools and plant .	1,50,000	1,50,000	
		TOTAL .	13,50,000	10,00,000	
		BOMBAY (MAHARASHTRA)			
14.	REDI				
		First Priority			
		(*i*) Construction of wharf 400′ × 50′ @ Rs. 1500/- per R. ft.	6,00,000	6,00,000	
		(*ii*) Construction of puckka approach road . .	20,000	20,000	
		(*iii*) Dredging the channel .	1,00,000	1,00,000	
		(*iv*) Providing aids to navigation, buoys, etc. . .	1,80,000	1,80,000	
		(*v*) Ancillary buildings .	60,000	60,000	
		(*a*) Office-*cum*-store building 30′ × 30′ @ Rs. 20/- per sq. ft. Rs. 18,000			
		(*b*) Staff quarters :			
		Class III 2 Nos. Rs. 24,000			
		Class IV 2 Nos. Rs. 16,000			
		Land acquisition 2,000			
		Rs. 60,000			
		(*vi*) Water supply arrangement for port . . .	40,000	40,000	
		TOTAL .	10,00,000	10,00,000	

Sl. No.	Port	Name of work	Estimated amount	Probable expenditure during Third Plan	Remarks
			Rs.	Rs.	
15.	RATNAGIRI				
		First Priority			
		(*i*) Raising by about 12′ and widening low level jetty from 5′ to 15′ with landing facilities (Caisson construction for pier) 600′ × 15′ @ Rs. 80/- per Sft.	7,20,000	7,20,000	
		(*ii*) Extending jetty by 300′ × 15′ on R. C. C. piles, 300′ @ Rs. 80/- per Sft. .	3,60,000	3,60,000	
		(*iii*) Parking space with reclamation at shore (150′ × 60′) at Rs. 12/- per Sft. .	1,08,000	1,08,000	
		(*iv*) Electrification . .	20,000	20,000	
		(*v*) Extending road by about 500′ with pitching on sea side and surfacing . .	40,000	40,000	
		(*vi*) Water supply . .	40,000	40,000	
		(*vii*) 150 H. P. towing tug	2,50,000	2,50,000	
		TOTAL SAY .	15,40,000	15,40,000	
		Second Priority—			
		Staff quarters including land acquisition	2,00,000	2,00,000	
		(*a*) Class II 1 No. Rs. 30,000			
		(*b*) Class III 8 Nos. ,, 1,20,000			
		(*c*) Class IV 2 Nos. ,, 12,000			
		(*d*) Land acquisition ,, 38,000			
		2,00,000			
		TOTAL	2,00,000	2,00,000	
16.	General				
		First Priority—			
		Dredgers for internal dredging	12,00,000	12,00,000	
		(*a*) 2-ton grab dredger 6 lakhs			
		(*b*) 3 Nos. 100-ton hopper barges . . 3 lakhs			
		(*c*) 1 No. 200 H. P. tug . . 3 lakhs			
		12 lakhs			
		TOTAL .	12,00,000	12,00,000	

Sl. No.	Port	Name of work	Estimated Amount	Probable Expenditure during the Third Five Year Plan
		BOMBAY (GUJERAT)		
17.	Surat			
		First Priority—		
		(*i*) RCC piled jetty extension 8000 Sft. @ Rs. 80/- per Sft.	6,40,000	
		(*ii*) Water supply arrangement	20,000	
		(*iii*) Electric lighting	20,000	
		(*iv*) 3-ton fixed hand crane	30,000	
		(*v*) Transit shed 100′ × 50′ @ Rs. 16/- per Sft.	80,000	
		(*vi*) Office and residence	1,00,000	
		(*vii*) Surfacing approach road	20,000	
		(*viii*) Bank protection works	50,000	
		(*ix*) One 150 H. P. tug	2,50,000	
		TOTAL Rs.	12,10,000	
18.	Broach.			
		First Priority—		
		(*i*) RCC piled jetty 250′ × 30′ @ Rs. 80/- per Sft.	6,00,000	
		(*ii*) Platform with retaining wall 250′ × 50′ @ Rs. 20/- per Sft.	2,50,000	
		(*iii*) Concreting bunder road 1000′ @ Rs. 40/- per L. ft.	40,000	
		(*iv*) Water supply arrangement	20,000	
		(*v*) Electric flood lighting	20,000	
		(*vi*) Dredging at jetty	50,000	
		(*vii*) 3-ton fixed hand crane	30,000	
		(*viii*) One 150 H.P. tug for towing sailing craft	2,50,000	
		TOTAL Rs.	12,60,000	
		Second Priority—		
		(*i*) Staff quarters	75,000	
		Class III-4 Nos. 60,000		
		Class IV-2 15,000		
		Rs. 75,000		
		(*ii*) Navigational aids	1,00,000	
		TOTAL	1,75,000	

Sl. No.	Port	Name of work		Estimated Amount	Probable Expenditure during Third Plan	Remarks
19.	Bhavnagar					
		First Priority—				
		(*i*) Improving lock gate working		34,40,000	34,40,000	
		(*a*) 3 additional wharping dolphins at the entrance on the south and 2 wharping dolphins on the north with cat-walk	15,00,000			
		(*b*) Channel marking buoys on each side of the channel for a distance of about 2 miles south from the entrance to the concrete jetty at Rs. 30,000/- for each buoy—	2,40,000			
		(*c*) Two electric capstans at the entrance having a pull of 10—12 tons	1,00,000			
		(*d*) 750 HP twin screw Kort nozzle tug of about 10-12 tons Bollard pull	16,00,000			
			Rs. 34,40,000			
		(*ii*) 4 Nos. fork lift trucks		2,40,000	2,40,000	
			TOTAL . Rs.	36,80,000	36,80,000	
		Second Priority—				
		(*i*) Lighterage arrangments in the new dock at concrete jetty :		23,45,000	23,45,000	
		(*a*) two mooring dolphins	2,00,000			
		(*b*) Arrangements for lighterage work to accommodate 4 barges along with certain work of retention of earth	6,45,000			
		(*c*) Two portal cranes for jetty and two 1½ ton cranes for lighterage wharf	5,00,000			
		(*d*) Dredging for turning basin and mooring	10,00,000			
			Rs. 23,45,000			
		(*ii*) Residential accommodation for staff		6,00,000	6,00,000	
		(*a*) Class II-1 No	29,800			
		(*b*) Class IIIA 3 Nos. of 2 units— accommodationfor 6—	63,200			
		(*c*) Class IIIB— 8 Nos. of 2 unit— accommodation for 16	1,48,000			
		(*d*) Class IV—38 of 2 units— accommodation for 76	3,57,000			
			TOTAL SAY Rs. 6,00,000			
		(*iii*) Repair facilities at Concrete jetty		80,000	80,000	
		(*iv*) Augmenting water supply from the city mains ‡		7,00,000	7,00,000	
		(*v*) Port office building at concrete jetty		3,00,000	3,00,000	
			TOTAL . Rs.	40,25,000	40,25,000	

Sl. No.	Port	Name of work	Estimated amount	Probable Expenditure during Third Plan	Remarks
			Rs.	Rs.	
		Third Priority—			
		Shifting sailing craft and lighterage facilities from "Steel jetty" to Akwada Creek when the "steel jetty" creek silts. .	12,50,000	12,50,000	
20.	Veraval				
		First Priority—			
		(*i*) 4 Nos. electric wharf cranes (1½ tons to 3 tons)	5,00,000	5,00,000	
		(*ii*) 350 H. P. tug	4,50,000	4,50,000	
		(*iii*) Wharehouses—50,000 Sft. @ Rs. 12/- per Sft.	6,00,000	6,00,000	
		TOTAL .	15,50,000	15,50,000	
		Second Priority—			
		(*i*) 4 Nos. Electric wharf cranes (1½ tons to 3 tons)	5,00,000	5,00,000	
		(*ii*) Workshop equipment . .	75,000	75,000	
		(*iii*) 600 tons of lighterage capacity . .	4,80,000	4,80,000	
		(*iv*) Staff quarters	6,00,000	6,00,000	
		(*a*) Class II-1 No. . . Rs. 29,820			
		(*b*) Class IIIA—3 Nos. of 2 units . . . . ,, 63,200			
		(*c*) Class IIIB-8 Nos. of 2 units ,, 1,48,900			
		(*d*) Class IV—38 Nos. of 2 units ,, 3,57,000			
		TOTAL SAY Rs. . 6,00,000			
		(*v*) Road and rail siding —2 miles in length	4,00,000	4,00,000	
		(*vi*) Wharehouses—50,000 Sft. @ Rs. 12/- per Sft.	6,00,000	6,00,000	
		TOTAL SAY .	26,50,000	26,50,000	
21.	Porbandar				
		First Priority—			
		(*i*) A lighter wharf 685 ft. in length .	8,60,000	8,60,000	
		(*ii*) Provision of mobile wharf crane .	2,00,000	2,00,000	
		(*iii*) Road to new wharf . . .	1,20,000	1,20,000	
		(*iv*) Provision of heavy lift arrangement .	1,50,000	1,50,000	
		(*v*) Additional lighterage capacity of 400 tons	3,20,000	3,20,000	
		(*vi*) Extension of the portyard lighting and water supply to the new site .	2,50,000	2,50,000	
		TOTAL. .	19,00,000	19,00,000	

Sl. No.	Port	Name of work	Estimated amount	Probable Expenditure during Third Plan	Remarks
			Rs.	Rs	
		Second Priority—			
		(*i*) Providing railway siding in newly developed sites on the opposite shore	3,00,000	3,0,,000	
		(*ii*) Staff quarters	6,00,000	6,00,000	
		(*a*) Class II—1 No . Rs. 29,820			
		(*b*) Class IIIA 3 Nos. of 2 units —Accommodation for 6 . . . . . ,, 63,200			
		(*c*) Class IIIB-8 Nos. of 2 units —accommodation for 16 ,, 1,48,000			
		(*d*) Class IV 38 Nos. of 2 units —accommodation for 76 ,, 3,57,100			
		TOTAL SAY Rs 6,00,000			
		(*iii*) Additional Lighterage capacity .	2,00,000	2,00,000	
		TOTAL. . .	11,00,000	11,00,000	
22.	Okha.				
		First Priority—			
		(*i*) Oil tanker berth	16,00,000	16,00,000	
		(*ii*) Transit shed	5,00,000	5,00,000	
		(*iii*) Passenger jetty on Okha side .	3,50,000	3,50,000	
		TOTAL. .	24 50,000	24,50,000	
		Second Priority—			
		(*i*) Shunting locomotive . . .	40,000	40,000	
		(*ii*) 72,000 Sft. of storage shed . .	8,00,000	8,00,000	
		(*iii*) Reclamation for increase working space for bauxite	1,50,000	1,50,000	
		(*iv*) Replacing the existing dockyard railway siding with news tandard 51 lbs. rails as per railway code . . .	3,50,000	3,50,000	
		(*v*) Two fixed fore and aft moorings .	2,00,000	2,00,000	
		(*vi*) Workshop equipment (2-air-compressors, a welding set and tools) .	1,30,000	1,30,000	
		(*vii*) Lighting arrangements in the dockyard	1,50,000	1,50,000	
		TOTAL. SAY . .	18,20,000	18,20,000	

Sl. No.	Port	Name of work	Estimated amount	Probable Expenditure during Third Plan	Remarks
			Rs.	Rs.	
23.	Sika.				
		First Priority—			
		(*i*) Lighterage capacity of 600 tons .	4,80,000	4,80,000	
		(*ii*) A shallow draft twin screw tug of 350 BHP	3,00,000	3,00,000	
		TOTAL SAY .	8,00,000	8,00,000	
24.	Bedi				
		First Priority—			
		(*i*) Improving the approach creek by dredging	7,50,000	7,50,000	
		(*ii*) Replacement of one towing tug of 350 B.H.P.	4,50,000	4,50,000	
		TOTAL .	12,00,000	12,00,000	
		Second Priority—			
		(*i*) Railway siding to new wharf constructed during the 2nd Plan . .	1,80,000	1,80,000	
		(*ii*) Providing road surfacing of the dockyard road including new roads to the newly developed site	2,50,000	2,50,000	
		(*iii*) Addition to the existing strength of lighters by 800 ton capacity . .	6,40000	6,40,000	
		(*iv*) Replacement of one towing tug of 350 B.H.P.	4,50,000	4,50,000	
		(*v*) Lighting arrangements in the new area and in the labour colony . . .	60,000	60,000	
		TOTAL .	15,80,000	15,80,000	
25.	General				
		First Priority—			
		(*i*) Dredger for internal dredging with ancillary craft	15,00,000	15,00,000	
		TOTAL .	15,00,000	15,00,000	

State-wise Abstract indicating priorities for each State.

Sl. No.	State	For Priorities	
		First Priority	Second Priority
		Amount in Rs. lakhs	Amount in Rs. lakhs
1.	Orissa	99·00	55·30
2.	Andhra Pradesh	42·00	23·80
3.	Madras	87·00	50·05
4.	Kerala	137·06	15·28
5.	Mysore	63·00	161·40
6.	Bombay (Maharashtra)	37·40	2·00
7.	Bombay (Gujerat)	155·50	113·50
	TOTAL	621·00	422·00

N.B.—Figures rounded to the nearest lakh.

APPENDIX XI

Cost of Transport of Iron Ore F.O.B. Paradip Port *

A. *Transport by road to Jenapur canal head and thence by canal*

		Rs.
1.	Cost of road transport from Tomka to Jenapur including loading and unloading	14·50
2.	Jetties, weighment and stacking	0·25
3.	Loading into boats	0·50
4.	Transport charges by boats from Jenapur to Lion's Rump	6·25
5.	Unloading charges	0·50
6.	Canal Tollage	5·19
7.	Loading into lighters and craft	0·50
8.	Lighterage	5·00
9.	Plot rent at dumping yards	0·25
10.	Stevedoring and trimming	1·13
11.	Skipping	0·35
12.	Port rates	1·00
**13.	Supervision and over-head charges	2·50
14.	Miscellaneous charges (Pilotage, launch, lighting, survey, wireless and hospital charges)	2·00
	TOTAL	39·92

B. *Transport by road to Jajpur Road Railway Station and thence by railway to Cuttack and thereafter by canal.*

1.	Cost of raod transport from Tomka mines to Jajpur Road railway station incluing loading and unloading.	11·5
2.	Railway freight from Jajpur Road to Cuttack	5·42
3.	Plot rent, etc. at Cuttack Dockyard	0·33
4.	Loading into boat.	0·50
5.	Transport charges from Cuttack to Lion's Rump	3·93
6.	Unloading charges	0·50
7.	Canal tollage	3·19
8.	Loading into lighters and craft at Paradip	0·50
9.	Lighterage	·00
10.	Plot rent at dumping yard	0·25
11.	Stevedoring and trimming	1·13
12.	Skipping	0·55
†13.	Port rates	
14.	Supervision and over-head charges	2·50
15.	Miscellaneous charges (Piltotage, launch, lighting hospital, survey and wire-less charges)	2·00
	TOTAL	38.30

* As given by the Orissa State Government.

**This has been calculated at 5% approximately of the total cost of iron ore.

†This has been calculated at 5% approximately of the total cost of iron ore.

APPENDIX XII

The Economics of Port Development at Paradip for handling 5,00,000 tons of iron ore per annum

RECEIPTS FOR 5,00,000 TONS OF IRON ORE

		Rs.
1.	Wharfage rate @ Rs. 2/- per ton (now being charged)	10,00,000
2.	Lighterage charges at the rate of Rs. 5/- per ton (now being charged)	25,00,000
3.	Lands (ground rent)	1,25,000
4.	Rent on buildings (10 % of staff salary)	1,00,000
5.	Hire charges for tubs	50,000
6.	Port charges @ 25 nP per N.R.T. (assuming 10,000 tons of ore per visit of steamer)	1,25,000
	TOTAL	39,00,000

EXPENDITURE

			Rs.
1.	Interest on capital @ 4 1/2 %		7,20,000
2.	Depreciation of assets (20 years for craft and machinery and 50 years for civil works)		5,39,000
3.	Staff :		11,00,000
	10 Class I and Class II Officers @ Rs. 1,000/- on an average per month	10,000	
	30 Class III officers @ Rs. 250/- p.m.	7,500	
	100 Class II and Class III crews @ Rs. 290/- on an average per month	29,000	
	200 Class IV employees including crews @ Rs. 100/- p.m. on an average	20,000	
		66,500	
	So, for 12 months Rs. 66,500 × 12 =	7,98,000	
	T.A. and contingencies	3,02,000	
		11,00,000	
4.	Maintenanee and operational charges	10,68,000	
	(*i*) Diesel oil at 10 gallons per hour and 120 working days for 20 hours, per tug (6 tugs) 1,44.000 gallons @ Rs. 2·05 per gallon	2,96,000	
	(*ii*) Lubricating oil and other stores at 20% of above	60.000	
	(*iii*) Insurance for 120 days @ Rs. 20/- per day for tugs and @ Rs. 5/- per day for lighters (6 tugs and 36 lighters)	36,000	
	(*iv*) Annual repairs to the tugs @ Rs. 5,000/- per tug	30,000	
	(*v*) Special repairs @ Rs. 10,000/- per tug per anum	60,000	

(*vi*) Painting and special repairs of the 36 lighters @ Rs. 5,000/- per lighter	1,80,000	
(*vii*) Maintenance of civil works at 2 % of capital (Rs. 51 lakhs)	1,02,000	
(*viii*) Maintenance of trucks and locos . . .	20,000	
(*ix*) Electric power	10,000	
(*x*) Maintenance of workshop machinery at 10 % of the cast	30,000	
(*xi*) Maintenance of buoys, etc.	24,000	
(*xii*) Maintenance of water and fuel barge . .	20,000	
(*xiii*) Maintenance of ore tubs	50,000	
(*xiv*) Operational cost of dredger	1,50,000	
	10,68,000	
Total	..	34,27,000

NET ANNUAL REVENUE: Rs. 39,00,000 — Rs. 34,27,000 = Rs 4,73,000
i.e., 3·00% of the capital cost.

APPENDIX XIII

Economics of the Scheme for development of Cuddalore Port for handling 5,00,000 tons of iron ore, 50,000 tons of general cargo and 1,00,000 tons of coal.

RECEIPTS

		Rs.
1.	Wharfage rate :	
	(*a*) Iron ore at Re. 1 per ton (present charges)	5,00,000
	(*b*) Coal at Rs. 1·25 per ton (present charges)	1,25,000
	(*c*) General cargo at Rs. 2 per ton (average assumed)	1,00,000
2.	Land (ground rent)	1,00,000
3.	Rent on buildings (based on 10% salary of staff for quarters, etc)	50,000
4.	Port dues (average 25 nP. per ton for 160 ships, each ship of 8,000 tons)	3,20,000
	TOTAL	11,95,000
	Say	12,00,000

EXPENDITURE

1.	Interest on capital (Rs. 78·4 lakhs) at 4 + 1/2 %		3,52,800
2.	Depreciation of assets		1,91,500
	(*i*) 20 years for craft and machinery etc. (Rs. 11·4 lakhs)	57,500	
	(*ii*) 50 years for civil works (Rs. 67 lakhs)	1,34,000	
		1,91,500	
3.	Staff salary		86,400
		Rs.	
	Class I (1 post) @ Rs. 1,200 p.m.	14,400	
	Class II (1 post) @ 600 p.m.	7,200	
	Class III (12 posts) @ Rs. 200 p.m.	28,800	
	Class IV (30 posts) @ Rs. 100 p.m.	36,000	
		86,400	
4.	Maintenance	..	2,14,500
	(*i*) 2 % for civil works (Rs. 67 lakhs)	1,34,000	
	(*ii*) 7 % for craft, machinery etc.	80,500	
	(Rs. 11·5 lakhs)	2,14,500	
5.	Dredging		3,00,000
	TOTAL		11,45,200
NETT REVENUE : Rs. 12,00,000 — Rs. 11,47,400 = say			54,800

i.e., 0·7 % *of capital*

APPENDIX XIV

Estimate for the development of Tuticorin into a 30 ft. harbour, with four alongside berths, two for coal, one for salt and one for general cargo

Serial No.	Items	Quantity or No.	Rate	Unit	Amount	Total
			Rs.		Rs. lakhs	
1.	Preliminary expenses including road to quarry .	L.S.	..	..	10·00	..
2.	Acquisition of land for rail and road approaches	L.S.	..	..	3·00	
3.	Dredging in turning basin and berth—					
	(*a*) in ordinary soil .	67,770 c.yds.	3·00	c.yd.	2·03	..
	(*b*) in rock . . .	25,96,800 c.ft.	1·50	c.ft.	38·95	
*4.	Construction of reclamation wall including filling with dredged material	..	..	..	352·31	..
5.	Construction of breakwaters Noses . . .	2,350 ft.	5,850	l. ft.	137·43	..
6.	Construction of Quay .	2 Nos.	27·73	lakh each	55·46	
		2,200 r ft.	5,000,	l. ft.	110·00	
7.	Navigational aids . .	L.S.	..	..	1·60	
8.	Transit sheds . .	60,000 sq. ft.	18/-	sq. ft.	10·80	
9.	Workshop building. .	27,500 sq. ft.	12/-	sq. ft.	3.30	..
10.	Construction of Dry Dock 200′ × 50′—sill—14·00.	..	..	..	8·50	
11.	Approach road . .	9 miles	2 lakhs	mile	18·00	..
12.	Internal roads . .	L.S.	..	..	5·00	
13.	Railway access . .	10 miles	Rs.2 lakhs	Do.	20·00	
14.	Construction of warehouse	48,000 sq. ft.	18/-	sq. ft.	8·64	
15.	Railway sidings and Marshalling yards . . .	L.S.	..	..	20·00	
16.	Cranes—					
	(*a*) Wharf Cranes—3 tons capacity . . .	7 Nos.	Rs. 3 lakhs	each	21·00	..
	(*b*) Wharf cranes—5 ton capacity . . .	1 No.	5 lakhs	each	5·00	..
	(*c*) Do.—Mobile crane 10 ton capacity . . .	1 No.	3 lakhs	each	3·00	

* For details see at the end of Appendix.

S. No.	Item	Quantity or No.	Rate	Unit	Amount	Total
			Rs.		Rs. lakhs	
	(*d*) For handling tetrapods and Boulders 5 cranes—2 tons capacity . .	2 Nos.	5 lacs	each	10.00	
17.	Purchase of Tugs—					
	(*a*) 1000 HP Twin screw Diesel tug filled with fire fighting and salvage arrangements . .	1 No.	20 lakhs	each	20·00	
	(*b*) 800 HP Twin screw Diesel tug. . .	1 No.	15 lakhs	each	15·00	
18.	Survey Launch . .	1 No.	1.3 lakhs	each	1·30	
19.	Rock breaker and dipper dredger . . .	1 No.	..	..	20·00	..
20.	Grab dredger . .	1 No.	..	..	15·00	..
21.	Dumb hopper barges 100 ton capacity . .	6 Nos.	1·5 lakh	each	9·00	..
22.	Tug for hopper barges 150—H.P.—2 Nos. .	2 Nos.	3 lakhs	each	6·00	..
23.	Narrow gauge Railway truck . . .	3 miles	80,000	mile	2·40	..
24.	Diesel Locomotives .	2 Nos.	36,000	each	0·72	..
25.	(*a*) Tipping wagons .	50 Nos.	3,000	each	1·50	..
	(*b*) Flat wagons for tetropods . . .	20 Nos.	3,000	each	0·60	..
26.	Diving boat and diving equipment . . .	L.S.	..	..	2·00	..
27.	Mooring boat . .	3 Nos.	10,000	each	0·30	..
28.	Workshop machinery .	L.S.	..	..	7·00	..
29.	Office building . .	L.S.	..	..	5·00	..
30.	Water supply . .	L.S.	..	..	10·00	..
31.	Electricity . . .	L.S.	..	..	10·00	..
32.	Stacking area . .	7,20,000	sq. ft. 130/-	100 sq. ft.	9·36	..
33.	Drainage . . .	L.S.	..	..	1·50	..
34.	Maintenance during construction . . .	L.S.	..	..	5·00	..
35.	Pilot Launch. . .	1 No.	..	..	1·50	..
					987·25	
	3% contingencies . .	..	..	..	29·62	..
	TOTAL . .	..	..	..	1016·87	..
	1% Workcharged Establishment . . .	..	..	..	10·17	..
	GRAND TOTAL SAY .	..	..	..	1027·00	..

*Construction of reclamation wall including filling with dredged material.

Location	*Distance*	*Rate*	*Amount*
		Rs.	Rs.
From — 30 to — 27 . . .	1640 ft.	Rs. 5,400 l., ft.	88,56,000
From — 27 to — 26 . . .	560 ft.	@ Rs. 5,160 l. ft.	28,89,600
From — 26 to — 25 . . .	600 ft.	@ Rs. 4,250/- l. ft.	25,50,000
From — 25 to — 24 . . .	540 ft.	@ Rs. 2,960/- l. ft.	15,98,400
From — 24 to —18 . . .	3000 ft.	@ Rs. 2,625/- l. ft.	78,75,000
From — 18 to — 12 . .	3600 ft.	@ Rs. 2,150/- l. ft.	77,40,000
From — 12 to — 6 . . .	800 ft.	@ Rs. 1,645/- l. ft.	13,16,000
From — 6 to shore . .	1,800 ft.	@ Rs. 760/- l. ft.	13,78,000
Front wall	1200 ft.	@ Rs. 825/-	10,38,000
		Total . . .	352,81,000
			or 352.31 lakhs

APPENDIX XV

Economies of development of a 30 ft. harbour at Tuticorin with four alongside berths, two for coal, one for salt and one for general cargo.

The basis adopted for the following estimates are:—

(*a*) Receipts on Wet Docks and Wharves based on the prevailing rates (landing and shipping fees and wharfage) for Cochin Port.

(*b*) Receipts from Railway Department, Land and Buildings and Port Department, are derived from the receipts at Cochin Port for the year 1956-57 in the proportion of cargo proposed to be handled at Tuticorin to that of Cochin for the year 1956-57.

(*c*) Expenditure under the heads Administration, Port Department, Traffic Operations, Other Maintenance, Pensions, Provident Funds, Other items, Rent, Rates, etc., Police and Audit fees, derived on the expenditure at Cochin Port during 1956-57 in the proportion of cargo proposed to be handled at Tuticorn to that of Cochin for the year 1956-57.

RECEIPTS

Rs. in lakhs

(1) *Wet docks and wharves* . . . . . Rs. 37·05

Commodity	Quantity tons	Rate Rs.	Amount Rs. in lakhs
Imports			
(*a*) Coal	2,00,000	1·80	3·60
(*b*) Food grains and fertilizers	60,000	4·13	2·48
(*c*) Raw cotton	30,000	4·75	1·43
(*d*) Gunnies	10,000	4·75	0·48
(*e*) Black sheets	5,000	6·25	0·31
(*f*) General Cargo for Ceylon*	10,000	4·50 (Average)	0·45
(*g*) General cargo for U.S.A. Europe and S.E.Asia (machinery, heavy)	50,000	6·0	3·00
(*h*) Lifts, raw cotton consumer goods (*i*) General cargo for Indian ports	20,000	4·0(say)	0·80
TOTAL	..	..	12·55
Exports			
(*a*) Salt	2,00,000	2·95	5·90
(*b*) Cement	1,75,000	4·00	7·00
(*c*) General cargo to Ceylon (onions, fish, textiles, chillies)	80,000	5·00 (average)	4·00

*Copra, betel and arecanuts and scrap iron.

Commodity	Quantity tons	Rate Rs.	Amount Rs. in lakhs
(*d*) General cargo to U.S.A., Europe and S. E. Asia (palmira fibre, textiles, cotton yarn)	90,000	5·2 (average)	4·70
(*e*) Caustic soda	30,000	4·40	1·30
(*f*) General cargo to Indian ports (cotton)	40,000	4·00 say	1·60
			24·50

Total of imports and exports = Rs. 37·05 lakhs

(2) Bunders and Jetties	0·12	
(3) Lands and buildings	6·40	
(4) Railway Deptt.	7·40	
(5) Port Department	4·30	
(6) Miscellaneous	2·50	
	or 57·77	
Total say	58·00	lakhs

Expenditure

(1) Administration	1·64	
(2) Port Department	3·12	
(3) Traffic operations	7·00	
(4) Dredging (maintenance dredging at Tuticorin will be negligible)	1·00	
(5) Other maintenance	4·67	
(6) Pensions etc.	0·11	
(7) Provident Fund Contributions	0·97	
(8) Other items	2·38	
(9) Rent, Rates, etc.	0·04	
(10) Police	0·63	
(11) Audit fee	0·20	
(12) Add for interest on capital at 4½%	46·20	
(13) Add for depreciation (50 years)	20·50	
Total say	88·46	
	or	
	Rs. 89·00	lakhs.

Nett annual deficit — Rs. 31 lakhs.

APPENDIX XVI

(A) *The break-up of cost for handling one ton of Ilmenite Sand at Kollithotam as supplied by the State Government.*

		Rs.
(1)	Dumping, bagging and stacking in the transit shed . . .	5·00
(2)	Head load from transit shed to Vallam	2·00
(3)	Handling from Vallam to sailing craft	1·65
(4)	Handling from sailing craft to steamer	2·55
	Total . . .	11·20

(B) *Annual fish landings at Neendakara from* 1955 *to* 1958

Year	By indigenous Boat M. Tons	By Mech. Boats M. Tons	Total M. Tons
1955	2,612	..	2,612
1956	3,204	181	3,385
1957	2,967	344	3,311
1958	2,911	298	3,209

APPENDIX XVII

The economics of port development at Neendakara for a traffic of 4 lakh tons per annum consisting of 3 lakh tons of ilmenite sand, 50,000 tons of cashew nuts and 50,000 tons of general cargo.

Receipts	Rs.	Rs.
(1) Wharfage		5,00,000
3,00,000 tons of ilmenite sand @ Re. 1/- per ton	3,00,000	
50,000 tons of cashew nuts @ Rs. 2/- per ton	1,00,000	
50,000 tons of general cargo @ Rs. 2/- per ton	1,00,000	
	5,00,000	
(2) Lighterage charges at the rate of Rs. 5/- (for ilmenite) per ton		15,00,000
(3) Lands and building		50,000
(4) Port charges @ 25 nP per N.R.T. (assuming 2,000 tons of general cargo and cashewnuts and 6,000 tons of ilmenite for each visit of steamer) roughly 100 ships of 8,000 tons N.R.T.		2,00,000
Total		22,50,000
Expenditure		
(1) Interest on capital 4½%		4,15,000
(2) Depreciation of assets (20 years for craft and machinery and 50 years for civil works)		2,77,000
(3) Staff		4,00,000
1 No. Class I officer @ Rs. 1,400/- per month	1,400	
2 Nos. Class II officers @ Rs. 600/- per month	1,200	..
20 Nos. Class III including crew and office staff @ Rs. 250/- average per month	5,000	..
150 Nos. Class IV employees including crew @ Rs. 100/- per month average	15,000	
	22,600 p.m.	
for 12 months = Rs. 2,71,200		
Add for T.A. and Contingencies	1,35,000	
	4,06,200	
	or	
	say 4,00,000	
(4) Maintenance and operational charges		7,09,400
(*a*) Fuel oil for 4 tugs assuming 120 working days of 20 hours and 5 gallons per hour 48,000 gallons @ Rs. 2·05 per gallon.	99,000	
(*b*) Lubricating oil and other stores—20% of above	20,000	
(*c*) Annual repairs to 4 tugs @ Rs. 5,000/- per tug	20,000	

Receipts	Rs.	Rs.
(*d*) Plating and special repairs to 36 lighters @ Rs. 5,000 per annum	1,30,000	..
(*e*) Special repairs to tugs @ Rs. 10,000/- per trg	40,000	..
(*f*) Insurance @ Rs. 10/- per day for tugs and Rs. 5/- per day for lighters for 120 working days	26,400	..
(*g*) Maintenance of civil works @ 2% of Rs. 62,00,000/-	1,24,000	..
(*h*) Maintenance of workshop machinery @ 10%	20,000	..
(*i*) Electric power	10,000	..
(*j*) Maintenance of buoys	20,000	..
(*k*) Operational cost of 12 inches dredger including repairs and insurance	1,50,000	
	7,09,400	
		18,01,000

Nett annual revenue Rs. 22,50,000 — Rs. 18,01,000
say = Rs. 4,49,000
i.e., 4·85 % *of the capital investment.*

APPENDIX XVIII

A NOTE PREPARED BY THE MANAGING DIRECTOR STATE TRADING CORPORATION OF INDIA ON THE POSSIBILITIES OF IRON ORE EXPORTS IN THE FUTURE

Indian iron ore has increasingly become one of the major items of export trade. The geographical position of India enables us to become a base source of supply to the Japanese Steel Industry as well as to the developing steel expansion programmes of the East European Countries, and Western Europe. The qualities of iron ore available for export are suitable for use in the open hearth as well as blast furnaces. They compare favourably with the qualities available in other major sources like Brazil, Canada, Sweden, Chile and North and South Africa. We have considerable deposits, especially in areas where the prospect of setting up large steel plants are not immediate. For a period of ten to fifteen years atleast beginning from 1960-61, it should be possible to export very substantial quantities of iron ore in order to earn foreign exchange as well as to develop, in the process, the transport and other facilities in the areas concerned. Moreover, the investments in the field of mining and transport yield dividends quickly, and practically the entire investment can be recovered within a period of ten years.

The significant rise in the value of iron ore exported from India will be appreciated from the figures given below:—

Year	Tonnage in lakh tons	Value in crorers Rs.
1956-57	18	9
1957-58	23	11·5
1958-59	21	10·5
1959-60	28	14
1960-61 (estimate)	40	20

It is estimated that in 1965-66, on the basis of the existing contracts the total export will aggregate to 7 million tons, which will yield at current prices Rs. 35 crores. At the same time, there are distinct possibilities of our being able to step this figure up to 9 million tons, provided our capacity to export is built up to meet the potential demand. The performance of the State Trading Corporation in organising increasingly large exports maintaining shipping schedules and quality controls have generated confidence among the buyers and they are now planning to increase their imports from India on a long term basis. New buyers in Western Europe are also turning to India and we have in the STC several propositions for consideration. A figure of 9 million tons in 1965-66 may be taken as a dependable figure for planning purposes.

This is exclusive of the two million tons to be exported from Visakhapatnam under the Rourkela-Vizag Project and the four million tons to be handled at Vizag under the Bailadilla Project. The 9 millions referred to will be procured from other mines in India.

In planning the fulfilment of the export targets the following considerations have to be borne in mind:—

(a) The areas of supply and their nearness to the ports.

(b) The facilities available on the railways and at the ports concerned.

(c) Full utilisation of means of transport other than rail, namely road and canal, as supplementary and/or complementary modes to the rail.

(d) The capacity of the mines to maintain and enlarge production in step with the export potential.

The Corporation has practically maximised the existing rail, road, canal and port facilities. In fact, today the limitation is not the overseas demand, but our capacity to export.

In planning the movements from the mines to the ports attention has also to be given to the growing needs of our own steel plants; production in the Barajamda-Barabil area as well as movement from the mines has to be reserved on a priority basis for the steel plants and only the surplus earmarked for export. The possibility of Calcutta handling much less than what she is now doing has to be kept in view. In making full use of the existing facilities the Corporation has not been guided solely by economics. The accent has been on stretching the capacity rather than on making the export only on a profit basis. For instance, exports through Cochin are being organised at no margin of profit. Exports through Kandla will have to be made at a distinct loss.

The present position therefore is that the available port and railway facilities are being used to the full, and there is a shortfall on some sectors even with reference to the current contracted demand. If the targets for 1956/66 are to be fully realised, some major development have to be programmed from now on and included in the III Plan projects.

Table I shows the export of iron ore export possibilities by the end of 1965-66. This estimate is on the basis of actual firm contracts for 1960-61, the quantities therein being enlarged in the light of information given by our buyers and the known expansion in their steel production programmes up to 1965-66.

Broadly speaking, our buyers would be grouped into three categories – (a) the Japanese Steel Industry (b) the East European Countries and (c) the West European buyers. The Japanese Steel Mills buy iron ore on a collective basis: the raw material requirements of the steel industry are arranged by a consortium. This consortium entered into a five year agreement with the State Trading Corporation of India in 1957 under which approximately 1½ million tons of ore is to be supplied. Actually, the Japanese purchases for 1960-61 aggregate to nearly 2¼ million tons. Presently, Japan is importing between 11 to 12 million tons. The imports from India, therefore, work out to 1/5th of the total. The

Japanese have indicated that their iron ore imports from all sources will be on the following pattern:—

1960	. . . . .	11·8 million tons
1961	. . . . .	15·3 ,,
1962	. . . . .	16·9 ,,
1963	. . . . .	18·9 ,,
1964	. . . . .	21·6 ,,
1965	. . . . .	24·4 ,,

The Japanese Steel Mills have also indicated from time to time that they would regard India as their base source of supply and that they would increase their purchases in the light of their increasing requirements, provided our prices continue to be competitive and our port and railway capacities were built up adequately to ensure a high rate of loading at the ports.

It has been estimated that India should be able to export in 1965-66 4¼ million tons out of a total import by Japan of nearly 25 million tons during that year. Japanese Steel Mills have concluded agreements with the Government of India in connection with the development of Rourkela and Bailadilla mines. In both these agreements it has been clearly stipulated that the purchase from these mines, namely 2 million tons per annum from the former beginning in 1964-65 and 4 million tons per annum from the latter beginning in 1966-67 would be additional to their normal purchases. In the forecast of the iron ore imports given by the Japanese Steel Mills up to 1965 the imports generated by the Rourkela and Bailadilla mines have not been taken into account. The tonnages from Rourkela and Bailadilla, which will materialise beyond 1965 are estimated by the Japanese to be additional to the level of imports indicated by them up to 1965. Other things being equal, therefore, we should plan for an export of 4¼ million tons to Japan in 1965-66 by the STC from private mines in India.

The East European countries have in the last two years been increasingly turning to India for their iron ore requirements. This process has been accelerated by the blocked rupee accounts which are operated for the enlargement of trade between us and these countries. The more they are able to import their manufactured products and raw materials into India the more rupee funds are built up by them which have to be used on the purchase of India goods and iron ore has been a substantial item on their shopping list. In 1960-61 the total to the East European countries and Yugoslavia will be of the order of 1·75 million tons. Steel production in these countries is expected to be trebled by 1965-66. Czechoslovakia, which is producing 6 million tons, has programmed to achieve a target of 12 to 13 million tons in five years from now; Rumania, whose production of steel is about a million tons, is raising her production to 3 million tons, after the new integrated 2 million ton plant under construction goes into operation; the GDR, Hungary and Poland are enlarging their steel output. The GDR started experimenting with Indian iron ore a year ago and they have now indicated that their imports from India would be very substantially increased. Taking all things into account, of the need for the East European Countries to utilise their rupee balances, it is anticipated that the export of Indian iron ore to these countries would rise to at least 3·5 million tons.

Among the West European Countries, Italy has become a regular buyer of Indian ore. In 1960-61 the quantity is one lakh tons. Other countries have not commenced purchases in India, mainly because relative higher price of Indian ore. West Germany, Belgium, Austria and the U.K. import their requirements from Sweden, Canada, Spain, North Africa and Brazil; the CIF costs of ores from these countries at the rest of intimation no cheaper compared to Indian ore delivered at these ports. However, lately there has been growing pressure of demand for Indian ore from the West European buyers who wish to develop alternative sources of supply. The Italians have advised the STC that from 1965-66 they would be in a position to import half-a-million tons of ore provided price-wise Indian ore compares favourably with other comparable ores, landed in Italy. The West German buyers have also indicated that they would import Indian ore in substantial quantity. It has therefore been assumed that by 1965-66 it should be possible for the STC to sell half-a-million tons at least to the West German Buyers.

From the above projection of demand for Indian iron ore it will be seen that the 1960-61 level of 1·5 million tons could be doubled by 1965-66 provided suitable steps are taken to expand the port capacities. Table II shows the capacities at each port for the export of iron ore in 1960-61 and on the basis of programmes already approved. It will be seen from this statement that the shortfall in 1960-61 would be of the order of 3·5 lakh tons, against a total contracted demand of 4·5 million tons and a shortfall of 2·6 million tons in 1965-66 a target of 9 million tons. In the succeeding paragraphs an attempt has been made to comment on each of the ports, the port and railway capacity required to be augmented, and the need for a major ore loading port on the West Coast in order to handle the growing volume of iron ore exports.

Calcutta.—Having regard to available railway capacity the tonnage that could be handled in Calcutta has been placed at 7·5 lakh tons in 1960-61. Ore moves to Calcutta from two directions; from the Bihar/Orissa mining areas and Barajamda-Barabil, and from the Tomka-Sukinda mining areas in Orissa—Jajpur to Calcutta. Broadly speaking, out 4½ lakh tons are moved from Barajamda-Barabil and three lakh as from Jajpur. Due to growing requirements of Hindustan Steel's apacity and the railway lines being used up for the moving of the ore from private mines at present, and later from Bolani and Bursua to Rourkela and Durgapur (Bokaro later on) the Railway Board have advised that the figure for export in these areas should be cut down drastically. Movement from Jajpur can at best be stepped up to 5 lakh tons. According to the Railway Boards' advice, the export target of Calcutta should be reduced to half-a-million tons. In planning the exports the STC have, however, based their estimates on the assumption that the mechanical handling facilities at Calcutta would need to be kept fully employed and that, therefore, the tonnage to be moved to Calcutta could still be maintained at 7·5 lakh tons. In other words, the possible shortfall in the capacity at Calcutta is not for the time being taken into account.

Paradip.—This port is fed by ore from Tomka-Sukinda lines of Orissa and the only means of transport to the port is by canal. Presently, the port is expected to handle 50,000 tons, as the season is open only for five months in the year, from December to April. Even after the road from the mines to Janapur is constructed it would not be possible

to increase substantially the rate of loading at the port as the bottleneck of the canal from Cuttack to Paradip would still remain. It is, therefore, assumed that at Paradip, until a railway line is built from the mines to Jenapur or some other station on the main line between Cuttack and Jajpur and until the transport system on the canal from Cuttack to Paradip is significantly improved, the total quantity to be exported from Paradip would not be in excess of one lakh tons, *i.e.*, two ships per month. An increase in the lighterage capacity of the port without a corresponding increase in the movement of the ore from the mines to the port would not be of much help. It is, however, necessary that the lighterage, capacity at the port should be adequate to handle a minimum of one lakh tons.

If the capacity of Paradip is to be raised above one lakh tons by 1965-66 the following facilities would be absolutely necessary:—

(1) A rail link from the mines to the main Cuttack-Jajpur line.

(2) Improvement of the canal transport between Cuttack and Paradip.

(3) If (i) and (ii) are done then, the export target may be raised to 2½ lakh tons. If, in addition, a rail link is built between Cuttack and Paradip the export target can be raised to 5 lakh tons. Above this figure, even with the railway facilities it would not be possible to undertake additional loading unless a major port is established.

Visakhapatnam:—The mining areas which serve Vizag port are situated in Bayyaram and in Bellary-Hospet. The movement from both these sources is of the order of a lakh to lakh-and-half tons. As this port will be fully employed with the export of ore from Rourkela in 1965 and from Bailadilla from 1966-67 onwards it is not proposed to use this port for the export of ores from private mines. From 1966-67 onwards the total tonnage to be handled by this port would be 6 million tons. No special facilities are therefore required at this port for the export of iron ore from other mines during the interim period.

Kakinada.—The main source of supply of ore for this port is Bayyaram and Bellary-Hospet. It is a lighterage port and at best the present target of 1·5 lakh tons can be raised to no more than 2 lakh tons. The deposits in Bayyaram are not considerable and it will be difficult to step up the present rate of raising. It is also difficult to increase the movement of the Bellary-Hospet ore to this port. No special facilities for exports of ore are needed at this port except improvement of the lighterage capacity.

Masulipatam.—This port is supplied by ore from Jaggavanetta-Veldurti and Bellary-Hospet. The Jaggayapetta deposits have become considerably depleted. Veldurti and Bellary-Hospet can maintain a supply of 2 to 3 lakh tons per annum. It will not be possible to step up this rate of input. The main requirement at this port is the improvement of lighterage capacity, certain navigational aids, dredgers etc.

Krishnapatam.—The STC propose to develop this port for the export of iron ore. The main source of supply of iron ore would be Cuddappa, Bellary-Hospet and Nayudupettah; the ores moving on Guntakul-Renigunta-Gudur Nellore line. Being a lighterage port, and having regard to

the ore stacking facilities it is proposed to commence with 50,000 tons in 1960-61 and raise it to one lakh in 1965-66, *i.e.* about one ship per month.

Madras.—Madras port is ideally situated for the export of ore from the principal areas of Bellary-Hospet and Bangalore M.G. and B.G. Present facilities are adequate only to handle about eight lac tons—7 lacs from the Bellary-Hospet and Cuddapah areas and about a lac of tons from Bangalore. This is the maximum quantity which can be moved by rail from the loading points. With the installation of mechanical loading facilities effective from August-September, 1960, and provided the railway movement is stepped up sufficiently, the total tonnage to be handled from Madras can be raised to 1·2 million tons.

The berth to be used for loading iron ore with the mechanical installation will be capable of receiving ore carriers of 15,000 tons capacity, provided the draught is not in excess of 30 ft. and the length of the vessel is not higher than 500 ft. It may be possible, if a second loading berth is built in the wet dock to raise the exportable tonnage to two million tons per annum. This will, of course, involve additional railway facilities between Guntakul and Madras and the Railways have estimated the cost for these facilities to be 1,500 lacs. On the assumption that these works will be included by the Railways in their annual works programme it has been assumed that by 1965-66 the tonnage to be exported from Madras will be two millions. It will not be possible further to augment this target. The transhipment at Guntakul is a bottleneck that would need to be eliminated if a high input of two million tons to the Madras Port is to be sustained. As an operational necessity the expansion of the BG line from Guntakul to Hospet will become inescapable. The costly process of carrying ore by road from the mines to Timmercharla could then be eliminated and block rakes can be run from the main loading points at Hospet, Kariganur, P.K. Helli and Bellary direct to the Madras port.

Cuddalore.—This lighterage port was started for ore loading by the STC about two years ago. The present capacity is two lac fifty thousand tons, and the main feeding areas are Bellary-Hospet loading stations. The Japanese Steel Mills have programmed for the purchase of high grade ore, preferably in nominated mines and it is planned to move this grade of ore exclusively through Cuddalore port. With the mechanical facilities coming into operation at Madras, it will not be possible to segregate different qualities of ore; for these technical reasons in the plans of the STC all high grade contracts for the Japanese are programmed to be fulfilled through Cuddalore. It will be possible to raise the tonnage in Cuddalore to five lac tons in 1965-66. The specific facilities required for reaching this target are given below:—

1. Additional movement facilities from Bellary/Hospet to Cuddalore—heavier train loads and additional number of rakes for a movement of 1/2 million tons per annum;

(2) Development of Spoil island, stacking yards and the rail connection to the Island.

(3) Stabilisation of the sand bar and additional lighterage facilities at the Port.

Cochin.—Ordinarily this port would be uneconomical for the export of iron ore. The nearest mining area is Bangalore M.G. and the distance *via* Banagalore and Jalarpet is 594 miles. The current FOB cost of the ore at the port is Rs. 51 to 56, which is practically equal to the current overseas sale price. If for any reason, there is decline in the world prices, export of ore through this port will have to be sustained at a loss. Nevertheless with a view to maximising the available rail and port capacities, the Corporation have programmed to export 75,000 tons ore during 1960-61. At any rate, it will not be possible to enlarge this figure further as the railway capacity between Jalarpet and Cochin varies round 50,000 tons.

Redi.—This port is not served by a railway line, the mines are situated near the coast. The grades of ore are low, comparable to the qualities available in Goa. The port, moreover, is open for traffic for five months in the year. Enterprising mine-owners have built two jettis and the maximum tonnage which can be handled at this port is presently 4 lakh tons and can be raised upto 5 lakhs only in 1965-66. The demand for the grade of ore available at this port is also limited.

Bombay.—The nearest iron ore mines are situated in Bellary/Hospet. Current railway capacity is four lakh tons. At best the figure can be raised to five lakh tons by 1965-66. This port is also somewhat uneconomical, on account of the long lead from the mines. The distance from Hospet to Bombay is nearly 589 miles and the FOB cost for the ore when loaded at Guntakul or Timmanchorla is higher than the ex-port price realised.

Kandla.—The capacity of this port is of the order of 2 lakh tons in the current year. On account of long lead from the mines in Rajasthan average distance is 550 miles—and difficulties in enlarging the output of these mines, it will not be possible to augment the current capacity. Moreover the grade of ore available at Rajasthan mines is not altogether suitable to the buyers. At this Port also, as in the case of Cochin and Bombay, due to the long railway lead the FOB cost works out to Rs. 55.50 which is higher than the FOB sale price. Nevertheless, the Corporation has programmed to export two lakh tons in 1960-61 and 21 lakh 50 thousand tons in 1965-66.

Karwar-Belikeri-Tadri.—All these three lighterage ports have been opened by the Corporation for ore traffic. The estimated capacities at these ports, having regard to available stacking grounds and lighterage facilities and the potentiality of road movement from Hubli is of the order of 4,50,000 ons ore moves from the Bellary Hospet mining area partly by rail upto Hubli and thence by road and partly all the way by road from the mines. The distance from Hubli to Karwar is 104 miles and to Belikeri about 100 miles and to Tadri the ore is moved all the way by road — a distance of 200 miles. All road movement from the mines to Karwar and Belikeri involves a haulage of 250 miles. The FOB cost is higher than the sale prices.

Apart from the limitations at the ports, the road is a bottleneck which will not admit of substantial increases over the targets for the current year. Rail capacity from Hospet to Hubli is presently adequate for a movement of 2 lakh tons. In order to realise fully the current port capacities at Karwar, Belikeri and Tadri two lakh tons require to

be moved by road from Karwar/Belikeri and 2,50,000 tons all the way by road from the mines, over a distance of nearly 220—250 miles. The magnitude of the road operation may be appreciated from the fact that on the Hubli Karwar stretch 100 trucks will be needed for transporting two lakh tons (pay load of 7 tons and 23 trips per month per truck) and for the movement of 2,50,000 tons all the way by road from the mines, 350 trucks (pay load 7 tons and 10 trips per truck per month).

Movement of iron ore by road over distances exceeding a 100 miles is even in the best of circumstances economically a precarious proposition. The investments involved in the trucks and in the heavy repairing and maintenance of vehicles are so heavy that unless it is desperately necessary to utilise every form of transport it is a wasteful utilisation of resources. With the building of the two lane road between Hubli and Karwar it may be possible to raise the movement capacity theoretically upto a million tons but the limiting factor will be the movement by rail from Hospet to Hubli. At best the capacity can be raised to 3 lakh tons per annum. As pointed out earlier the FOB cost of the ore moved all the way by road from the mines to the port of Karwar/Belikeri is Rs. 52 per ton, leaving no margin of profit. Any slight decline in the overseas prices will make the entire operation by road utterly uneconomical. Moreover, it has to be borne in mind that Karwar is at present a lighterage port open for five months in a year. Even if additional stacking capacities and a jetty are built, it will not be possible for the port of Karwar and Belikeri to handle between them more than 5 lakh tons. On the assumption that the road movements will be fully utilised and the ancillary railway capacity between Hospet and Hubli will be stretched to the maximum, a figure of 7,50,000 tons has been put down for 1965-66. It will be absolutely impossible to improve upon this figure unless a rail link is built between Hubli and Karwar and a major port working all the year round is established at Karwar. The estimated cost of the railway as given by the Railway is Rs. 11·00 crores (including railing stack and the cost of a major port with 30' draft capable of handling ore carriers and loading rate of 10,000 tons per day has been estimated by the Ministry of Transport at Rs. 11·00 crores.

Mangalore.—The port of Mangalore was opened for ore exports for the Corporation in March 1958. The areas from which ore is supplied are situated in Tumkur and Chitaldurg and the average distance from the mines to the port is 190 miles. Having regard to the present road conditions, the capacity for this port is estimated at 1,50,000 tons. The FOB cost of the ore works out to almost the present sale price. The number of trucks engaged in this operation is in the region of 150 trucks (pay load 7 tons and 14 trips per month per truck). When the Banasundra Hassan Mangalore road is improved, it may be possible to raise the present target at Mangalore to two lakh fifty thousand tons, bearing in mind the limitations on the lighterage and other facilities at the Port.

From the above description of the available and the programmed facilities at various port, it will be clear that against a contracted demand for 4½ million tons in 1960-61 the shortfall will be 3·5 lakh tons; in 1965-66 the port capacities will aggregate to 6·4 million tons whereas the demand will be of the order of 9 million tons. In other words on the overall the deficit in the port capacity of 3½ lakh tons will rise to 2·6 million tons. It would be obvious, therefore, that other things being equal, even for

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230 miles and from Kemmangundi the principal point for the low grade areas to Mangalore *via* Hasan, the distance will be again about 200 miles.

The figures of cost of the ore at the port of Mangalore as assessed by State Trading Corporation show that this port will be the cheapest for exports compared to Madras, Cuddalore, Bombay and Karwar.

The crux of the problem really rests on two factors (a) the comparative economics of developing the port (Mangalore or Karwar) to a depth of 34 ft. initially and 38 ft. ultimately, (b) the prospects of traffic other than the ore traffic. Ore carriers are growing in size; Italy is known to be building carriers with a capacity of 40 to 50 thousand tons. The technical Directors of Finsider with whom I discussed the possibilities of exporting iron ore from a major ore loading port from the West Coast advised me that we should plan for a draught of 38 ft. and if possible even 40 ft. From the technical data made available so far, it would appear that the cost of deepening the Mangalore port will be substantially cheaper than at Karwar. So far as traffic other than iron ore traffic is concerned, in the light of the traffic survey report of the National Council of Applied Economic Research and the discussions of the Technical Sub-Committee of the Intermediate Ports Development Committee a figure of 6 lakh tons other than ore traffic should be taken into account in respect of Mangalore. The traffic to Karwar is comparatively of a negligible order. There is in addition to these considerations certain other factors to be kept in view. Firstly, Karwar can handle only high grade ore. There are no large known deposits of low grade iron ore. On the other hand, Mangalore will be well situated to serve low as well as high grades. The Mangalore-Hassan link will assist in the tapping of new areas on the West Coast near Mangalore. Already the Mysore Government are prospecting regions within a distance of 100 miles from Mangalore known to contain substantial deposits of marketable ores. It has also to be borne in mind that the Railway Board have completed an engineering survey of the Mangalore-Hassan line, where so far no survey has been undertaken of the Hubli-Karwar route. From all points of view, therefore, technical feasibility, economics of building a major port, the low cost of the ores to be exported, the size of the deposits which will feed the port and the prospects of traffic other than iron ore, Mangalore would seem to be the port that should be established on the West Coast for impeting the normal expansion of iron ore export traffic. If it is accepted in principle that this port should be developed as a major ore loading port and the connecting railway line between Mangalore and Hassan is included in the programme for new constructions in the third Plan period, there would be no difficulty in securing such foreign exchange as would be involved for the project from the State Trading Corporation's buyers of iron ore. The main problem would be the allocation of rupee resources in the third plan for the development of the port and the construction of the link. So far as the mining side is concerned, Board of Mineral Development, Mysore, have indicated that such investments as are required would be found by them within their own allocation; these will be supplemented by the assistance of the private mine-owners who are now working the mines in Chitaldurg and other districts.

TABLE I

Estimate of iron ore export possibilities based on firm prospects

	1960-61 Last year of the 2nd Plan (in lakh tons)	1965-66 Last year of the 3rd Plan (in lakh tons)
Japan	25·0	45·0
Czechoslovakia	11·0	20·0
Poland	1·0	2·0
G.D.R.	1·5	3·0
Rumania	1·5	4·0
Hungary	0·5	2·0
Yugoslavia	2·0	4·0
Italy	1·5	5·0
West European countries other than Italy	1·0	5·0
TOTAL	45·0	90.0

TABLE II

Port capacities for export of iron ore on the basis of programmes already approved

	1960-61 (in lakh tons)	1965-66 (in lakh tons)
Calcutta	7·50	7·50
Visakhapatnam	1·25	1·00
Paradip	0·50	1·00
Kakinada	1·50	2·00
Masulipatam	2.00	3·00
Cuddalore	2·50	5·00
Kishnapatam	0·50	1·00
Madras	2·00	20·00
Cochin	0·75	1·00
Mangalore	1·50	2·50
Karwar	3·00	7·50
Belekiri	1·50	
Tadri	1·00	
Redi	4 00	5·00
Bombay	4·00	5·00
Kandla	2·00	2·50
TOTAL	41.50	64·00

APPENDIX XIX

. .l cost per ton of handling ilmenite sand through the proposed port at Nendakara

	Rs. Per ton
ilmenite sand into lighters	0·50
[illegible]	5·00
p and trimming	1·50
harges	1·00
TOTAL	Rs. 8.00

APPENDIX XX

*Statement of shoals in the Tapti River**

Serial No.	Bar position	Length of shoal	Depth over shoal at various stages of tide					
			High spring		Mean Spring		Neap Tide	
			Full	Ebb	Full	Ebb	Full	Ebb
1	Opposite to the village of Umra—1/2 mile from Umra	200 yards	6 ft.	Exposed	2 ft.	Exposed	2 ft.	Exposed
2	Between Umra and Magdalla—1 mile from shoal No. 1	2 miles	Always remains exposed except at the time of floods.					
3	Between Umra and Magdalla—250 yds. to the west of shoal No. 2	150 yds.	8 ft.	1 ft.	6 ft.	1 1/2 ft.	4 ft.	1/2 ft.
4	Opposite to Magdalla village—1 mile from Magdalla	200 yds.	10 ft.	2 ft.	7 ft.	1 ft.	5 ft.	1/2 ft.
5	Opposite to Gaviar village—1/4 mile from the shore at Gaviar	2 miles	Always remains exposed except at the time of floods.					
6	Between Gaviar and Dumas—3 miles from shoal No. 5	1/2 mile	8 ft.	1 1/2 ft.	6 ft.	1 ft.	2 ft.	Exposed
7	Opposite to Dumas village—250 yds. away from the Dumas Chowpey	1 mile	3 ft.	1/2 ft.	1 1/2 ft.	Exposed	Exposed	Exposed
8	At the mouth of the River—2 miles from Dumas to the north	2 miles	10 ft.	1 1/2 ft.	5 ft.	1/2 ft.	3 ft.	Exposed
9	Opposite to Hajira between Mora and Kavas —1 mile from Hajira	1 mile						

*This is based on a 1925 Survey.

APPENDIX XXI

...ing shoals in the Narmada river as obtained from the longitudinal survey carried out in 1959

2	3	4	5	
Bar position	Length of shoal	Governing depth of bar at L.W.O. S.T.	Rise of tides	
			springs	neaps
...n Jageshvari and Ambeta .	15,000′	1′	28′	17′
...ate Suva	12,000′	1′	23′	14′
... .	1,500′	3′	18′	12′
... .	5,000′	dries 2′ above L.W.O. S.T.	11.5′	7′

APPENDIX XXII

The Transportation charges per ton on Soda Ash and Caustic Soda from Mithapur to different port towns by the all rail and sea routes

From Mithapur to :	Bombay		Calcutta		Cochin		Madras	
Per Ton (Gross)	On Soda Ash Rs.	On Caustic Soda Rs.	On Soda Ash Rs.	On Caustic Soda Rs.	On Soda Ash Rs.	On Caustic Soda Rs.	On Soda Ash Rs.	On Caustic Soda Rs.
A. *Sea Route*:								
1. Transportation charges from Mithapur to Port Okha, and Port dues and other charges at Okha	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63
2. Freight by Sea . . .	25.50	36.00	49.50	55.00	31.50	47.50	45.00	48.50
3. Insurance and handling charges at ports . . .	5.74	6.44	10.69	12.27	8.65	9.44	6.65	8.63
Sub-Total . . .	36.87	48.07	65.82	72.90	45.78	62.57	57.28	62.76
4. Transport to & unloading at godown . . .	3·99	3·99	9·49	9·49	2·75	2·75	3·75	5·00
TOTAL . . .	40·86	52·06	75·31	82·39	48·53	65·32	61·03	67·76
B. *Rail Route*. (for full wagons loads)	33·50	33·50	69·00	62·00	73·20	73·20	62·00	62·00

APPENDIX XXIII

Estimate for the development of an all-weather harbour for 34 ft. steamers at Mangalore with 3 alongside berths two for general cargo and one for ore fully mechanised.

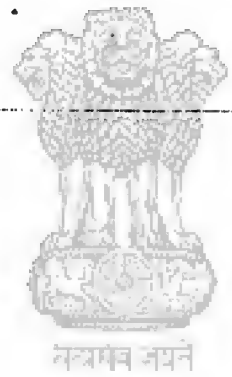
Item No.	Items of work	Quantity	Rate Rs. n.P	Per	Amount in lacs Rs.
1	2	3	4	5	6
1	(*a*) Preliminary expenses including provision of canal 3 miles long, land acquisition, service roads, from quarry to canal head etc.		L.S.		12·68
	(*b*) Service roads from quarry to canal head .	2 miles			
2	Dredging of approach channel to —3800 inner channel to —37 and basins to —36 under water with dredger excluding depreciation charges of dredger including disposal of spoil as directed:				
	(*a*) Approach channel .	21·96 lacs. c. yds.	1·50	c. yd.	32·94
	(*b*) Inner channel and basins . . .	65·45 lacs c. yds.	2·00	Do.	130· 0
*3	Construction of breakwaters.				
	(*a*) South breakwater including caissin portion and Nose at—26.00 .				328·08
	(*b*) North breakwater do Nose at —22.00 . .				
4	Construction of groynes at approach to turning basin 600 ft. long .	2 Nos.	1 69 lacs.	each	3·38
5	Shore protection works .				
	**(*a*) Construction of Bund including pitching on the spit . . .				14·20
					522·18

*and**See end of appendix for details.

2	3	4	5	6
				522·18
(*b*) Longitudinal shore wall	2,000 ft.	150·00	feet	3·00
(*c*) Cross groynes . .	4 Nos.	10,000·00	each	0·40
6 Reclamation				
(*a*) Dressing and levelling (filling included in item 2) . . .	120 lacs sq. ft.	1·00	100 sq. ft.	1·20
(*b*) Reclamation wall double brushwood groynes (filled with earth and cross groynes every 500 ft.) .	1000 ft.	10·00	feet	0·10
7 Navigational aids				
(*a*) Fairway lighted buoy 12′ dia. . . .	1 No.	1 lac.	each	1·00
(*b*) Channel lighted buoys 9′ dia. (every 2000 ft.) .	10 Nos.	50,000·00	each	10·00
(*c*) Leading lights . .	2 Nos.	20,000·00	each	0·40
(*d*) Breakwater lights .	2 Nos.	10,000·00	each	0·20
(*e*) Groyne lights . .	2 Nos.	10,000·00	each	0·20
8 Steamer mooring buoys .	14 Nos.	50,000·00	each	7·00
9 Diversion of Gurpur River including construction of bund across Gurpur River . . .				5·00
10 Construction of locks .	2 Nos.	2·5 lacs	each	5·00
11 Providing workshop building and machinery .	L.S.			10·00
12 Purchase of Cutter Suction cum drag suction dredger	1 No.			150·00
13 Purchase of twin screw diesel tug.				
(*a*) 1000 H.P. tug . .	1 No.			20·00
(*b*) 800 H.P. tug . .	1 No.			15·00
Purchase of Pilot Launch .	1 No.			1·50
15 Purchase of Mooring boats 30′ long timber hull .	3 Nos.	1000·00	each	0·30
16 Construction of Dry Dock . . .	L.S.			21·68
				774·16

1	2	3	4	5		6
17	Purchase of 100 T steel barges . . .	8 Nos.	1 lac.	each		774·16 8·00
18	Purchase of 300 H.P. diesel twin screw tugs for towing barges . . .	2 Nos.	5 lacs	each		10·00
19	Providing narrow gauge track	32,000 r.f.t.	15·00	r.f.t.		4·80
20	Purchase of diesel locomotives for narrow gauge line	2 Nos.	36,000·00	each		0·72
21	Purchase of narrow gauge railway wagons					
	(*a*) 10 ton capacity (flats) .	10 Nos.	4,000·00	each		0·40
	(*b*) 3 ton capacity (tipping)	50 Nos.	3,000·00	each		1·50
22	Purchase of Survey Launches 30′ long . .	1 No.	1·3 lacs	each		1·30
23	Purchase of cranes for construction work .					
	(*a*) Floating cranes of 10 ton capacity at a radius of 45′ including pontoons . . .	1 No				9·00
	(*b*) Truck or track mounted 10 ton capacity at a radius of 12 ft. and 3 ton at 40 ft. . .	5 Nos.	1·80 lacs	each		9·00
24	Construction of one ore berths . . .	800 ft.	5,000·00	ft.		60·00
25	Railway sidings . .	L.S.				30·00
26	Drainage . . .	L.S.				5·00
27	Electricity . . .	L.S.				10·00
28	Construction of roads .	4 miles	80,000·00	mile		3·20
29	Water supply . . .	L.S.				10·00
30	Stacking area for iron ore .	4·8 lacs sq. ft.	80·00		100 sq. ft.	3·84
31	Construction of 2 general cargo berths including transit sheds, warchouses, quay cranes etc. .	2 Nos.	75 lacs	each		150·00
						1070·92

1	2	3	4	5	6
					1070·92
32	Maintenance during construction . . .				5·00
	TOTAL . . .				1075·92
	3 % contingencies . .				32·28
					1108·20
	1% for work-charge establishment . . .				11·08
	GRAND TOTAL . .				1119·28
	Add for mechanical ore handling plant including erection				150·00
					1269·28
				or say	12·70 crores.



Details of construction of breakwaters and the Bund.

*Item 3

South Breakwater

Location	Average cost per foot run in (Rs.)	Length (ft.)	Amount (Rs.)
—26 to —24	4,800	700	33,60,000
—24 to —22	4,610	960	44,25,600
—22 to —18	4,100	1,050	43,05,000
—18 to —12	3,450	770	26,56,500
—12 to —6	2,200	550	12,10,000
6 to 0	1,350	400	5,40,000
Junction at—23	4,610	600	27,66,000
Return ends	1,185	400	4,74,000
Caisson st. portion	8,220	200	16,64,000
Caisson Nose	7,60,000	..	7,60,000
North Breakwater			
—22 to —18	4,100	865	35,46,500
—18 to —12	3,450	780	26,91,000
—12 to —6	2,200	550	12,10,000
—6 to —0	1,350	400	5,40,000
Return at ends caisson	1,185	200	2,37,000
Straight portion	8,220	200	16,64,000
Caisson Nose	7,60,000	..	7,60,000
TOTAL			3,28,09,600

** Item 5

	Rs.
66,50,000 c.ft. Earth work at Rs. 6/ per 100 c.ft.	39,900
9,89,520 sq. ft. Stone pitching 2 ft. thick at Rs. 103 per 100 sq. ft.	10,19,210
TOTAL.	14,18,210 or 14.20 lacs.

APPENDIX XXIV

A. *The economics of developing an all-weather port at Mangalore for 34 ft. draft steamers with 3 alongside berths*

The basis adopted for the following estimates are:

(*a*) Receipts on Wet Docks and Wharves based on the prevailing rates (landing and shipping fees and wharfage) for Cochin Port.

(*b*) Receipts from Railway Department, Lands and Buildings and Port Department are derived from the receipts at Cochin port for the year 1956-57 in the proportion of cargo proposed to be handled at Mangalore to that of Cochin for the year 1956-57.

(*c*) Expenditure under the heads Administration, Port Department, Traffic Operations, Other Maintenance, Pensions, Provident Funds, Other items, Rent, Rates, etc., Police, and Audit fees, derived on the expenditure at Cochin Port during 1956-57 in the proportion of cargo proposed to be handled at Mangalore to that of Cochin for the year 1956-57.

RECEIPTS

Rs. 35·67 lakhs

Wet docks and wharves:

	Quantity tons	Rate Rs.	Amount Rs. in lakhs.
*Steamer Traffic**			
(*a*) Existing traffic (excluding ore, cashew nuts, coffee, and general cargo)	40,000	4·50 (average)	1·8
(*b*) Increase due to all-weather working	20,000	4·50 (average)	·9
(*c*) Traffic from Bhadravati and Bangalore area	1,00,000	4·5 (average)	4·5
(*d*) Diverted traffic from other ports	50,000	4·5 (average)	2·25
(*e*) Food grain and fertilisers	75,000	4·13	3·10
(*f*) Misc. general cargo	15,000	4·5	·68
(*g*) Iron ore including loading by mechanical ore loading plant	20,00,000	7·0	140·00
B. *Sailing vessel traffic* General cargo	3,00,000	1·0	3·00
			156·23

*As estimated by the Committee.

	Rs. in lakhs
	Rs. per ton
B.F.	156·23
2. Lands and buildings	16·54
3. Railway Department	19·06
4. Port Department	11·22
5. Miscellaneous	5·42
	208·47

EXPENDITURE

1. Administration	4·23
2. Port Department	8·80
3. Traffic Operations	18·19
4. Dredging	*15·00
5. Other maintenance	12·31
6. Pensions	0·28
7. Provident Fund contributions	2·51
8. Other items	6·17
9. Rents, Rates, etc.	0·12
10. Police	1·63
11. Audit fee	0·50
12. Interest on capital at 4·5% (on Rs. 12·8 crores)	57·15
13. Add for depreciation (50 years) 11·3 crores at 2% 1·5 crores at 4%	28·40
14. Operation cost of mechanical ore loading plant	10·00
Total expenditure:—	165·29
Net annual revenue:	43·18

*This assumes maintenance dredging of one million tons at the rate of Rs. 1·50 per ton. This will vary in the light of actual experience.

APPENDIX XXV

*The transport cost of iron ore F.O.B. Karwar Port from Hospet.**

	Rs. per ton
1. Loading trucks at Mines	0·50
2. Road transport from Mines to Hospet station	2·50
3. Unloading truck at Hospet	0·31
4. Loading wagons at Hospet	0·50
5. Railway freight to Hubli	8·18
6. Unloading wagons at Hubli	0·62
7. Loading trucks at Hubli	0·50
8. Road transport from Hubli to Karwar	17·50
9. Unloading trucks at Karwar	0·50
10. Loading lighters at Karwar	0·75
11. Lighterage, stevedoring and trimming	5·62
12. Port shipping dues	0·80
13. Difference in rate, miscellaneous expenses and suppliers profit	2·53
	40·81

NOTE.—In case of ore of above 65 % iron content, the State Trading Corporation pays the suppliers 0·75 per point per ton extra.

Despatch and demurrage is to suppliers account.

*Particulars as supplied by the Mysore State Government.

APPENDIX XXVI

NOTE OF DISSENT BY SHRI H. P. OZA, ON INTERMEDIATE PORTS DEVELOPMENT COMMITTEE REPORT OF APRIL, 1960 AND AGREED TO BY SHRI GHANSHYAMLAL GOPALJI THAKKER.

The Committee consisting of several Members, representing various interests and diverse angles of approaches, is not likely, and indeed need not produce an unanimous Report. It is a great compliment that the Report has been produced with agreement of such a large number of Members. Considerable time has been spent in discussions and drafting and redrafting to produce it.

2. The Report deals with development of Intermediate Ports, that is, the development of Ports administered by the Maritimes States. I, as an Officer in-charge of the State Ports of a Premier Maritime State, feel differently on some points and I shall deal with some of the important ones.

3. The development tempo in our country precludes the old idea of "seeing traffic" before even undertaking small works. Our transport requirements as a result of successive Five Year Plans are so great that we need not be too shy of providing basic facilities ahead of requirements. My experience of these ports is that facilities contemplated and provided have been found to be inadequate; traffic has generated faster than it takes to put up port facilities. This tempo will increase and if we are to be in tune with overall transport requirements so as to ensure even progress, there is no escape from providing facilities at well selected State Ports. If the necessary facilities are not provided, local industrial development will suffer and the State Government being directly answerable and in day-to-day touch with the needs cannot allow this to happen.

The very essence of planning is coordination and I cannot agree with the statements in the Report that a particular port should be developed as an All Weather Port or facilities should be put up if certain amount of traffic develops. Industries will not be started unless transport is ensured and if we are to insist that traffic should develop before transport is ensured no beginning of development can be made. I can understand in a normal commercial port that indication of traffic in the form of having attained certain tonnages is a safe and possibly desirable criterion. But the same standard cannot be applied in case of ports which are required to handle substantial industrial cargo. In such cases the development project of a port has to be co-ordinated with the setting up of industries. To illustrate: Crores of rupees are being spent in Porbandar on industrial projects and outlet will have to be provided for the produce. The industries had satisfied themselves from the State Government that the requisite port facilities for their cargo will be provided. We cannot now turn round and say that we shall await traffic to generate upto a

certain level before deciding upon port development. Industrial production is a continuous process throughout the year and the transport facility also should be available uninterruptedly throughout the year.

The Report has laid considerable stress on the Iron ore traffic and in fact an exclusive chapter has been devoted to this traffic. The Committee is charged with the responsibility of selecting suitable intermediate ports for intensive development for future requirements and should have considered more liberally the needs of the handling of foodgrains, salt, coal, cement rock-phospate, fertilizers and soda ash. The industrial programme of the Third Five Year Plan period was not available and t Committee depended for traffic forecasts in several cases on the industr progress so far being made. While planning development of ports in th Second Plan we did not reckon the Iron Ore Export trade that has developed. But now that this trade has gained momentum, considerable importance is attached to it. The present importance is due to our need of foreign exchange and our competitive prices. With change in emphasise of first or decline in the world prices the trade can fluctuate materially.

My point is that we should have selected and recommended development of suitable intermediate ports which can handle increased traffic that is bound to generate. Recently under P.L. 480 agreement has been entered into with the United States of America for 16 million metric tons of wheat and 1 million metric tons of rice to be suppplied in four years. In addition 0·8 million tons of wheat from other normal sources is also to be imported. This will need handling facilities to the extent of 5 million tons per annum; and it is not taken into account while assessing the needs of port capacities. It is true that import of foodgrains is not a permanent feature. But it is certainly not an extremely short term feature. The important point is that in developing country the seaborne trade increases and it is prudent to provide for the necessary port facilities ahead of the traffic development. Commodities like foodgrains in intermediate ports can play a very vital role. They should be handled at the convenient ports nearer to the areas of consumption so that long rail haulages can be avoided resulting in economy of transport, and no less important in our context, relieving the pressure on the railways. As for example, the deficit of Gujarat in foodgrains can very conveniently be met with by handling foodgrains steamers at ports like Bhavnagar and Navlakhi. Happily this has started and in the months of March, April and the first ten days of May the port of Bhavnagar has handled 10,174 tons, 11,795 tons and 6,760 tons of wheat respectively. If account had been taken in the report of cargo of this nature the traffic estimates of the State Goverument would have been found to be realistic.

7. The subject of coal has been controversial. On the basis of the existing rail-freight structure for coal vis-a-vis sea borne freight it is uneconomical to bring coal by sea. Railways today are moving coal in greater quantities resulting in less movement by coasters. But it seems to me that a stage has come when coal will have to be moved in increasing quantities by sea, particularly to more distant regions like Saurashtra coast. For the protection and strengthening of the coastal shipping this cargo will be important and also with the existing industrial tempo in regions like Saurashtra with limited connecting rail capacity there seems no alternative but to move coal, at least to the centres of consumption on the coast, by sea. Account of this commodity in traffic is also not

taken by the Committee and I am afraid that unless port capacities are developed we may find ourselves unequipped to handle the cargo resulting in retardation of industrial tempo. In ports like Cuddalore and Tuticorin certain amount of coal import is taken. It is my view that some account should have been taken at ports like Porbandar, Veraval and Bhavnagar, if not at Sikka and Okha also.

8. Generally speaking, except for Iron Ore, the report has estimated the traffic on the lower side. In important centres like Tuticorin, Porbandar and Veraval traffic assessment by the end of the Third Five Year Plan is only made, although in case of some other ports assessment for ten years is taken into account. I am convinced that the traffic will generate much faster than what is assessed and also the needs of the ports should have uniformly been judged in all cases for a period of not less than ten years. Today the minor ports are inadequately equipped and with the impact of progressive Third Five Year Plans I have no doubt that development undertaken at the technically suitable sites, with possibilities of traffic, in the form of mineral ressources, increase in agriculture, or industrial potential, will not only lie idle but give positive impetus to the regional and national development.

I shall now deal with some points pertaining to some of the ports with which I am directly connected.

Bhavnagar.

9. I agree with the report that no oil berth should be provided *inside* the impounded basin at Bhavnagar Concrete Jetty. But I cannot subscribe to the suggestion of providing lighterage arrangements in this basin itself, at an estimated cost of Rs. 23,45,000. With this cost of lighterage arrangements and the corresponding capital cost of lighters and tugs, we can conveniently put up an additional berth which can result in much quicker and more economical handling of cargo. I also do not agree that lighterage facility in Akwada creek need not be provided now. Bhavnagar has a sailing craft traffic of 97,480 tons and it is now time to ear-mark steel jetty area for this traffic and develop a compact area round abont the Concrete Jetty, to handle steamer traffic. This will necessitate the development of Akwada Creek, for lighterage work.

10. In paragraph 9.36 it is stated that looking to the traffic expected in reasonable time provision of additional berths is not an urgent necessity. In para. 9.36 of the report therefore new berths are not recommended on considerations of traffic. However, in para. 9.38 while considering the recommendation of the Ship Repairs Committee it is stated that "as regards earmarking one of the new berths for Ship repairs this Committee has not recommended the construction of any new berth." The need of Ship Repairs berth has been considered by the Ship Re pairs Committee and there is no reason why a berth should not be put up for this purpose if it is to be adequately utilised.

Veraval.

11. In para. 9.42 the traffic forecasts for the port of Veraval is 3,00,000 tons by the end of the Third Five Year Plan. This is based on "existing trade" of 1,70,000 tons. It will be useful to know that Veraval actually handled in the year 1959-60 a trade of 2,14,941 tons, although in

1958-59 trade was 1,70,640 tons. This trade does not include any industrial trade in bulk or cement. It is very apparent that the traffic estimate is on the low side. Veraval with its hinterland has a good scope for traffic and the State Government shall have to be ready with the All Weather Port Project for Veraval.

Porbandar.

12. The traffic estimates of Porbandar in para. 9.54, by the end of the Third Five Year Plan, is 3,50,000 tons. It is on this basis that the Report has given Second Priority in para. 53 for the development of "All Weather Deep Draft Port" at Porbandar. With the capital outlay in progress at Porbandar on Cement factories, Soda-Ash Plant, Solvent extraction Plants. Textile Mill etc. there is no reason to be sceptical about the availability of traffic exceeding 5 lakhs tons, in the next 5 to 10 years. And the construction of an All Weather Port in itself should take about five years. It is therefore almost suicidal for the progress in the hinterland of Porbandar to wait till the traffic develops before undertaking development scheme. I cannot therefore subscribe to the Second priority allotted to the development of Porbandar into an All Weather Port.

13. The former State of Saurashtra had commissioned the services of the Consulting Engineers of Sir Bruce White, Wolfe Barry and Partners of London who in their report of May 1958 have estimated the cost of All Weather Port with one alongside berth at Rs. 3.03 crores, for two alongside berths at Rs. 3.63 crores and for four alongside berths at Rs. 4·68 crores, inclusive of 10 per cent contingencies and 7½ per cent engineering charges. The Technical sub-committee went into this question and suggested certain changes, in particular the widening of the approach channel from 400 to 800 ft. and the provision of a 750 I.H.P. towing tug. I agree that a towing tug is essential and that widening the channel will be desirable. If the channel is not widened there may be a few days in the monsoon when it may be hazarduous to negotiate the channel and it will be wiser not to bring in or take out vessels during these few days. But for an expanding port like the port of Porbandar that can be considered a handicap and it will be desirable to provide a wider and therefore safer channel.

14. Although traffic estimates of 3½ lakhs tons is made by the Committee by the end of the Third Five Year Plan, for traffic on account of Cement export of 1,00,000 tons and Soda-Ash of 80,000 tons, no corresponding provision for transit and storage godowns is made in the normal development programme either in 1st or second priority. The State Government will have to provide this and other requisite facilities for the handling of cargo.

Appendix XXVII

NOTE OF DISSENT

By

DR. C. R. KRISHNAMOORTHY, I.A.S.

(Planning Secretary and Additional Development Commissioner, Kerala)

I am sorry that owing to my other official preoccupations I could not attend the final meeting of the Committee when the report was finalised and could not, therefore, have the benefit of discussion about the final recommendations with the other members of the Committee. I find myself, however, unable to subscribe to the view expressed by the Committee about the port of Beypore in Kerala.

2. Before taking up the case of Beypore port, I have to make one general observation. The development of a major port in a country is governed by several considerations of which the flow or quantum of traffic is only a minor one; and there are more vital considerations to be thought of like defence, strategic location, balance economic development, etc. This gains added importance in the present context of economic planning when the development of a port has to fit into the pattern of planned development in the country. This becomes even more urgent when with the problem of scarce means for alternate ends that the nation is now confronted with and there is the most imperative need for the optimum utilisation of available resources, in a way most advantageous to the nation as a whole. So set, I feel that this is a problem that requires closer examination by a more expert body with persons bringing to bear expert knowledge on the subject and in particular, the over-all conditions of defence, strategic importance and economic development rather than by a Committee of the present kind composed purely of officials, half of whom are Port Officers in the different States, each pulling up for the State that he represents.

3. The Committee was appointed in March 1958. But I joined the Committee only in September 1959. I understand that the Committee expressly desired the Government of Mysore to have a traffic survey for Mangalore port undertaken by the Government of Mysore. I am not aware if any such suggestion was made by the Committee to any of the other States. I know that no such suggestion was directly or indirectly ever made to the Government of Kerala. Even still, the Government of Kerala have asked the National Council of Applied Economic Research who have conducted the traffic survey for Mangalore, to have a similar survey conducted for Beypore. They have not yet submitted their report and it may be available within the next two or three months. Even without such an expert traffic survey, I feel that the estimate of future

traffic indicated by the Committee in their report in para 6·23 is an obvious under-estimate. In forecasting the future traffic of an all-weather port at Beypore, several factors have to be borne in mind. With the tempo of development as evinced by the Five Year Plans and the country poised ready to enter the stage of industrialisation the future holds promise of enormous development. For a variety of reasons, this area remained undeveloped in the past. The creation of a major port in any locality is bound to attract industry in its vicinity thereby generating a wave of economic activity and expansion of trade in the region. Madras is a notable instance of this kind where the development of the port helped develop trade and commerce in the region. The point needs no elaboration that it is like Marshal's anology of two blades of a pair of scissors; one does the cutting when the other stays in position; and it is difficult to say which one does the cutting, as the one cannot function without the other remaining in its place. The growth of industries is dependent on several factors of which the means of communications and transport in the region and the facilities for easy outlet are one of the most important; and the development of a port is conditioned by the rate of economic development in the region and the volume of trade and commerce which the port has to serve.

4. This raises the question of the hinterland. The Committee has observed:

> "The hinterland at the port, a narrow coastal strip hemmed by Cochin, a major port, 90 miles to the south and Mangalore, another intermediate port, 120 miles to the north, and restricted by the almost impassable Western Ghats on the east, limits the traffic which may pass through this port to that which will orginate from or destined to this narrow strip of land."

It is well known that trade never honours such limitations unless it is forcibly canalised through particular channels. As an example Bombay is an island, but for the last four hundred years it has functioned with its hinterland stretching over half the Indian sub-continent. It is common knowledge that the Western Ghats are not so impassable as the report would suggest. The Western Ghats, which was acting as a barrier in the past to the flow of trade from the hinterland of Coorg, Mysore and some parts of Madras, is now rapidly giving way to the needs of commerce. There is free movement of traffic by through bus and lorry service from Tellicherry to Coorg; and the State Transport Department are, in collaboration with the Mysore State Transport, operating direct bus service between Cannanore and Mysore. There has been a long-standing demand for the hinterland to be opened up by a metre gauge railway line connecting Mysore City and Coorg through the Ghats; and it will not be long before this becomes a reality. As regards Madras State, from any point on the broad gauge line from Madras to Cochin, Beypore is 27 miles shorter in rail-lead than Cochin.

5. Both Kozhikode and Beypore (the latter is only a sub-port of Kozhikode situated on the mouth of a river six miles south of Kozhikode) are only fair weather ports now and they are virtually closed to traffic during the period of the southwest monsoon from June to September,

when the trade is forcibly diverted to Cochin. If Beypore is opened as an all-weather port, this traffic will find its natural outlet through Beypore. In the light of these considerations, the State Government have, in their memorandum presented to the Committee, worked out a forecast of trade to the tune of about 7 lakhs tons per year as shown below:

1.	Traffic as existing in 1954-55.	2,68,768	tons
2.	The normal increase based on the upward trend on the previous five years.	1,56,400	,,
3.	Traffic diverted from the minor ports of Cannanore, Tellicherry, Badagara and Azhikal, especially during the monsoon.	30,000	,,
4.	Traffic that may be diverted from Kozhikode and Beypore to Cochin during the 3 months in the monsoons (assuming the average monthly trade for 3 months)	1,43,723	,,
5.	Traffic that is diverted for Cochin Harbour due to the shorter rail lead on any point on the main line.	50,000	,,
6.	Bunker coal.	30,000	,,
		6,76,891	tons
	or say	7,00,000	tons

It must be noted that in working out the above forecast no credit has been taken for the trade from the hinterland region of Coorg and Mysore nor the fillip that the opening of a rail link from Tellicherry to Coorg would yield.

6. In the course of preliminary discussions, the Committee adopted the view that a trade of the volume of about 10 lakhs of tons would alone justify the development of a port as an all-weather port. In the final report, however, I find this has been reduced to 5 lakhs of tons. In para 3.11 of the report, the Committee has suggested that "when the traffic at Paradip reaches this figure of 5.50 lakhs tons per annum it may be necessary to provide an all-weather port at Paradip". Similarly, in the case of Mangalore, the traffic estimated by the Committee is only of the order of 5 to 6 lakhs tons per annum, with the conversion of Mangalore as an all weather port and the supply of a railway link between Mangalore and Hassan. Yet the Committee has recommended the development of Mangalore as an all-weather port. I am unable to see how in the absence of any other overwhelming consideration in favour of any particular port, different standards could be applied for different ports and how with the prospect of a volume of trade of 5 to 6 lakhs tons in Paradip or Mangalore the Committee could recommend their development as a major port but not Beypore with a traffic forecast of the size of about 7 lakhs of tons on the existing basis alone regardless of the hypothetical factors like the development of a rail link.

7. This brings me to the question of the technical aspect of the port. It is common knowledge that the question of development of a port in the west coast between Bombay and Cochin formed the subject of detailed consideration by the West Coast Ports Development Committee and they pronounced in no ambiguous terms that Mangalore was technically unsuitable. In spite of this the present Committee is unqualified in its recommendation for the development of Mangalore as a major port. Considering the fact that the question of Mangalore did receive some exhaustive consideration at the hands of the committee of persons

of some knowledge and eminence, I would suggest that the question deserves some more expert examination before a final decision is taken by the Government of India for its development as a major port so as to be certain that the investment is perfectly a sound proposition.

8. I have referred to Mangalore in the above paragraph as it furnishes a contrast to Beypore. The question of developing Beypore formed the subject of an elaborate study and enquiry by no less a person than Shri I.G. Chacko, who was then an Officer on Special Duty in the Ministry of Transport and has now been the Member-Secretary of this Committee. It is common knowledge again in Kerala that Shri Chacko, in the course of his study, visited the port and collected information and data in consultation with the local Port Officers and he submitted a report to the Government of India. It is strange that no copy of this report was sent to the State Government and even more strange that it was not made available at any time to a Committee, when the Committee was charged with the duty of examining the question of developing the port. I have to place on record that my own request for the report was dismissed by the Chairman with the remark that it was not a report but only a note prepared for internal use by an officer of the Ministry of Transport. I can only think of John Mills' famous plea in favour of freedom of speech and say that whatever may be the value or the absence of value of the report, whether called by the name of note or report, a document prepared after an elaborate study by a responsible officer of the Government of India should have been made available to the Committee as extent material on the subject so as to help the Committee in its own deliberations. I understand that Shri Chacko has in his Report found Beypore fit for development as an all-weather port and had even suggested a scheme for execution in two stages, first for the conversion of the port into an all-weather port to facilitate steamers of the type now ordinarily calling at Beypore and Kozhikode to enter the estuary and to work in stream moorings throughout the year and in the second stage to provide a minimum of two berths for steamers to work and ancillary facilities.

9. To sum up, my views are:

(i) The development of major ports in the country is governed by several considerations like defence, strategic location, balanced economic development, etc., and it should be examined by a high-level committee and not by one of the present kind composed of officials half of whom are State Port officers.

(ii) Having regard to the fact that a committee composed of some persons of knowledge and eminence had found Mangalore to be unsuitable for development as a major port, the question should be subjected to closer examination by an expert body so that there is no avoidable waste of resources or infructuous expenditure.

(iii) The case of Beypore port should be examined in the light of Shri Chacko's report and the considerations that I have raised in my note.

C. R. KRISHNAMOORTHY

TRIVANDRUM,
28th May, 1960.

GMGIPND—L—192 TC—10-8-60—500

Chairman's comments on Shri Krishnamoorthy's Minute of Dissent

(1) The Committee had the following non-officials as members:

(1) Shri T. M. Goculdas

(2) Shri S. N. Haji

(3) Shri G. G. Thakkar

(4) Shri N. L. Kanoria

(2) Shri Krishnamoorthy himself has no technical qualification.

(3) Shri Chacko himself was Member Secretary of the Committee and has signed the report without a minute of dissent.

H. P. MATHRANI

Chairman

Intermediate Ports Development Committee.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